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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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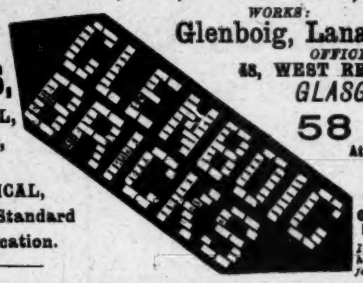

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EDITORIAL NOTES.

The Institution Programme.

NOTWITHSTANDING the publication of the Address of the President (Mr. Thomas Goulden, M.Inst.C.E.) and the various reports by the Research Committees, together with the paper by Sir George Beilby, F.R.S., there will be a highly interesting technical programme for the members of the Institution of Gas Engineers, at their meetings on Oct. 11 and 12, in the Central Hall, Westminster. The programme is published in detail in other columns; but to-day we cannot here specifically refer to the items, in view of the programme only being available as final preparations are being made for the printing of this week's issue. But in every respect the subjects in the reports and papers that will be before the members are of such transcending importance in these times of change that this fact alone will serve as a strong magnet to London for all the professional men of the gas industry. On the two days there are to be sittings both morning and afternoon; but there is much, and that highly important, to be discussed. It was a good thing that the Council resolved, in view of the deferment of the annual meeting, to allow pre-publication of so much of the prepared material. This will be a relief; otherwise there would have been uncomfortable congestion. The members will have the felicity of meeting their President and Mrs. Goulden at a reception and dance on Tuesday evening; and the pleasure will be mutual. Thursday there will be opportunities for visiting the East Greenwich works of the South Metropolitan Gas Company, by invitation of Dr. Charles Carpenter and his colleagues; and Sir George Beilby, the Director of Fuel Research, will receive members at the Fuel Research Station. For exact particulars as to these visits, the official programme in other columns had better be consulted, in order to prevent disappointment. We are looking forward to an excellent meeting in respect of the number of members attending, the material that will be contributed, and the profit and pleasure that will be derived.

Cheaper Coal Prospects.

THROUGHOUT the country cheaper coal is wanted; but what are the prospects that it will be obtained? We turn to the Presidential Address delivered by Sir John Cadman, K.C.M.G., D.Sc., to the Institution of Mining Engineers, and to that by Mr. J. Kane to the National Association of Colliery Managers. From these addresses we do not gain much hope; but they do point unerringly, if indirectly, to the main causes of high prices for coal. When the causes of an evil are found, then those causes are the directions in which to work for amelioration. In Sir John's address, we find known causes compounded with an amount of hypothesis as to collateral ones; but this hypothesis is countered by the hard facts presented by Mr. Kane in his address a week or two earlier. Sir John's analysis puts the high price of coal down not only to wages, but to low production per man, cost of transport, and over-legislation, including the seven-hour day. The low production, he says, may be partly due to the exhaustion of the thicker and more accessible seams, and the necessary extension of the underground transport of coal. However much there might be an inclination to sympathize with this partial transfer of responsibility for low output from men to changed circumstances, the inclination is at once stemmed and diverted by Mr. Kane's reminders regarding what has recently been. Only as lately as 1913, 287 million tons of coal were produced in this country at a comparatively low cost. This was equal to about 260 to 270 tons annually per man employed, which is not our record average. The highest reached is about 300 tons, which is less than one-third of what is accomplished in America, where, in 1918, 942 tons of bituminous coal were raised per man. And Sir John will have some difficulty in maintaining his suggestion as to the part played by contributory causes, when it is remembered that one week in December last, despite the seven-hour day, 5,307,000 tons of coal were produced; and even then Mr. Kane gives authority for saying that collieries were not working at their maximum capacity. These figures prove conclusively that it is not inefficient machinery, exhaustion of seams, or bad management that account for the low outputs which were experienced during 1920, and which even now obtain, on the average of per person employed. The seven-hour day has not had the stimulating effect that the Sankey Commission confidently anticipated; the fair drop in output through reduced time in relation to men employed has been largely exceeded.

Sir John has great knowledge of mining matters; but in this address he prefers to theorize rather than take his stand upon practical considerations. There is no question that the cheapening of coal rests largely in the hands of the miners; and no other conclusion could be drawn even if a thorough investigation were, as he suggests, instituted into the causes of the low output. Considering the chances of a lowering of costs, his thoughts seem to turn more to this being accomplished not through greater manual energy, but through the substitution of that energy by mechanical power. At the present time, improved technique in obtaining coal and its more scientific utilization are receiving attention; and Sir John believes that the engineer and the chemist, each in his own line, will prove the real saviours of the coal industry. He is of opinion that the more general application of machinery would benefit the mining industry of the country. It would, if the miners were not so much masters of the situation. It must not be overlooked that the reduction of output per man and in the total has been during those years in which there has been—not the maximum possible, but a greater use of machinery in British mines, and curiously with more men employed. The fact is in Sir John's mind, though he expresses it in a sentence that is understood by the educated; to the more obtuse mind, it may appear to be nothing but a few words the meaning of which need not concern anyone. He warns that any improvement that might be effected by machinery cannot be assessed by the standards of production and conditions existing in America, as is frequently done; and, then, "the obstacles to the introduction "of new and better machinery are human and psychologi- "cal rather than financial and technical." Thus while more machinery would help if properly utilized, there is the fear that it would not be; and present experience rather suggests that there is ground for the fear.

So far, we are not much nearer any reason for hoping for a substantial reduction in the price of coal, unless some miracle happens, and a new spirit takes possession of the miners and their leaders, resulting in the output of coal being brought back to something like an average of 300 tons per man per year. Even then we could not hope, other conditions remaining the same, for any approximation to 1914 prices. Miners' wages are to be brought to an economic basis on Oct. 1. At least so it is ordained; but what this means is an economic basis with agreed principles attached. High wages, short working time, low production, overmanning of collieries, high cost of wages, stores, timber, management, insurance, repairs, &c., and transport charges together con-

stitute the causes of the high coal prices of to-day. Only by spreading total costs over a larger production will any great reduction of price be permissible; and it is time this fact was made abundantly clear to the public mind. The country is faced in this matter with a very heavy handicap. If the miners had the will, they could do much to remove it. But the signs of the existence of that will have not formulated themselves sufficiently to be observed.

In Sir John's address, there were references to grading and cleaning, and perhaps we may look somewhat more hopefully to advance in this direction than was possible a short time since. The increases in the percentages of ash, he thinks, are mainly eloquent of the demoralization of the coal industry brought about by Government control. We are under the impression the word "mainly" is not justified. The "control" was largely due to the Miners' Federation, and to their policy of getting advantages—both direct and indirect—for the miners in the matter of pay, no matter who else was harmed in the result. The injury to the country generally, and to industry in particular, has been immense. However, it is satisfactory to find Sir John saying he is confident that every member of the Institution of Mining Engineers will use whatever power and influence he possesses to see that the public gets a squarer deal from private companies than was ever to be had from the State. We trust they will. On a cognate point we are not altogether with Sir John when he suggests that now that gas is sold on the calorific basis coal should also be sold on a similar basis. We would just as soon see it bought on ash and moisture standards, seeing that coal of fairly good calorific value might contain so much ash and moisture that the uneconomies produced by them might go far to neutralize any good resulting from buying on the calorific basis. In the gas industry, ash takes up carbonizing space provided at heavy capital cost—heavier to-day than ever—and spoils the intrinsic and therefore market value of coke. Moisture in coal also costs money; the lower it is the better. But on the principal subject a substantial reduction in the price of coal has not at the moment any prospect over which we can rejoice and be thankful.

Neutralizing and Drying Sulphate.—A Simple Process and a Good Experience.

A PAPER that will do more to advance the practice of making neutral and dry sulphate of ammonia than any amount of general argument and presentment of theoretical considerations is that which Mr. J. B. Hansford, the Engineer and Manager of the Bedford Gas-Works, read last week at the meeting of the Eastern Counties Gas Managers' Association. It is a paper alive with practical experience, and with results expressed in figures which all can understand. In effect, the contribution is constituted of three parts—prior and present experience in regard to local demand; a description of the home-made plant and the process adopted to secure neutrality and dryness; and the results—analytical, financial, &c.

After reading the paper, we should like those sulphate of ammonia makers who (closing their eyes to the competition of synthetic ammonia and other forms of nitrogenous fertilizers) are still unconvinced that there is need for making neutral and dry sulphate, to state whether they can (1) give any other explanation than that which Mr. Hansford supplies as to why he was only able up to 1916 to sell less than 10 p.ct. of his make locally, and had to send 90 to 95 p.ct. out of the district, despite the fact that it is partly an agricultural and market gardening centre; and (2) say whether they would be prepared to compete against the Bedford quality of sulphate for business in their own areas with sulphate not neutral and containing a high percentage of moisture. There is confidence (and it is confirmed in Mr. Hansford's mind by present experience) that it was the physical condition of the sulphate which formerly caused his local sales to be so low—a condition necessitating some special preparation of the material by the farmers, which entailed considerable labour and expense, especially with the tools at their disposal. Furthermore, the users complained of souring of the land by the continued use of the sulphate, which is attributed to the considerable percentage content of free acid, and the imperative hand-sowing of the material. Now with acid and moisture free sulphate there are no complaints; and this year it is hoped to sell locally the whole of the quantity produced. A good business is also being developed for small garden and allotment use, by selling 7-lb. and 14-lb. bags of sulphate at 1s. 6d. per 7-lb. bag, which works out to £24 per ton—a figure that is several pounds per ton in advance of the present home market price. The work that is being done at Bedford is a protection and guarantee to the local production of sulphate of ammonia; and the responsibility rests on every producing gas-works management to do all possible to cultivate their local market. Otherwise, the retention of the business will be a serious matter with passing time and developments in other directions. The fact has to be recognized that in this matter of sulphate quality it is the buyer and not the seller who has in his hands the power of determination.

Before adopting the plant and process described in the paper for effecting neutrality and drying, preliminary conclusions were arrived at which served as guiding-lines in making the development. Other processes that achieve the same ends are before us in one form or another. The product from each is very similar; and, given similarity of result in efficiency and physical characteristics, the only thing that matters is the cost. In this respect, for a production of the dimensions of that at Bedford, the plant and process stand in excellent position. There is, distinct from good result, one thing about the plant and process that is very attractive—that is, the simplicity. The principal difference between this and other processes is that the saturator bath is worked-down to neutrality before the charge is removed—thus making the actual neutral product; loss of ammonia and discoloration being avoided by providing means to enable the still gases to be shut-off from the bath when the neutral point is reached. The plant and process for rendering the sulphate neutral and the drying apparatus are so concisely described in the paper that we will not refer to them here. Other devisers of processes will naturally see superior features in their own; but, after all, the sole deciding factors are results and costs.

The results are good. An average analysis shows: Ammonia 25·7 p.ct.; nitrogen, 21·16 p.ct.; moisture, 0·14 to 0·18 p.ct.; free acid, *nil*. The moisture is not quite so low (0·04 p.ct.) as in, at any rate, another process of a more pretentious order. It will be noted that in the Bedford process the "mother liquor is entirely eliminated," while in certain other processes some inquirers have suspected trouble from surplus mother liquor. The statement of claim for the Bedford process is certainly highly attractive. The capital outlay is comparatively small; no additional working expenses beyond the running of the drying machine; and little or no technical supervision. These features do not exhaust the list. Mr. Hansford is to be congratulated on the ingenuity of his process, which, from the description, is free from complication, and may almost be classed as automatic.

In the concluding part of the paper, one or two suggestions are made, which will perhaps receive consideration in the proper quarters. The author invites the British Sulphate of Ammonia Federation to publish standardized tests for the analysis of sulphate of the grades into which they have standardized it. He also submits a good case for stating makes in pounds of nitrogen instead of pounds of sulphate per ton. He looks hopefully to the direct process of sulphate manufacture being ultimately successful in gas-works operations; but at the moment the hope does not appear to have any very substantial backing. However, these are more or less asides from the main part of the paper, which we commend as a valuable contribution to an important question bearing upon the future of a secondary product threatened by considerable competition. The commercial stability of the product rests upon suitability; and suitability will be the factor that will gain and retain the home market.

Threatened Descension of the Ascension.

AMONG the details of our gas-making processes, economies have to be sought. The ascension-pipe must not escape observation in the quest for improvement. It is a mischief maker of no small degree. There is a strong indictment of it in the paper Mr. W. H. Warren, of Beckton, read before the members of the Eastern Counties Gas Managers' Association a week ago. It is responsible for losses of gas, tar, and ammonia; but still it is allowed to go on perversely in its wasteful habits and labour-creating propensity. There are causes for the stoppages and losses that take place in ascension-pipes—heavy seals, high retort temperatures, and slack charges. Mr. Warren catalogues them; and he refers

to many of the attempts that have been made to remedy the conditions. Little has been heard of the "remedies" after their introduction. Silence is eloquent. But there is one American remedy, about which a good deal has been heard before from trials across the water, and what has been heard has been to its advantage. Now we learn more about it in the paper by Mr. Warren. It is the Congdon standpipe, which, with its fittings, takes the place of an ordinary ascension-pipe. By it gas is quickly removed from the retorts—the gas passes upwards through the pipe, and liquor flows down past the retorts, collection being made in a trough in which the stand-pipe is sealed, and which has connection with tanks for separating the tar from the liquor. There are also means for disconnecting the retorts from the standpipes, and there are other details, to which attention will be directed by consulting the paper.

Nothing has previously been heard of a trial of the Congdon system in this country. There has been a disposition here to go on in the old traditional way for removing gas from retorts. But experiment has been made of the system at Beckton; and the paper tells us of what has been learned so far. We hope that enterprise will allow the story to go further in a future communication; for there is technical importance as well as interest in it. The experiment has been made upon two horizontal settings at Beckton, with the retorts ranged in two vertical rows. There was much trouble with the old 7-in. ascensions; but although the experience with the Congdon system, constructed faithfully to American design, has not been all that could be wished, the trial has been enlightening, and has shown how the principles may, by some amount of modification in design, be applied to British conditions. For instance, the stand-pipes are built of $\frac{3}{16}$-in. plate, which are prone to leak upon change of temperature—for example, after Sunday's rest; and Mr. Warren is of opinion that a more satisfactory job would be realized if the standpipes were constructed of cast iron. The short connections from the retort mouthpieces to the standpipes, intentionally left to their own devices, become solidly blocked-up; but it is found that a door hook passed through them after each draw will keep them clear. Trouble was expected from liquor striking the valve discs, and being projected into the mouthpieces. The disposition of the discs has been altered; and there is now no projection of liquor where it is not desired. The valve gear was found to be of flimsy make; and this has been materially strengthened. It is seen that the structural faults are easy of remedy. An important thing, in regard to pipe stoppages and the labour they entail, is that the standpipes were examined after last winter's work—in February—and were found to be perfectly clean. This alone is a first favourable step in a change from traditional practice. Since, they have been at work without incident until August last; and, when examined then, three were found perfectly clean, but the fourth had an accumulation of pitch between the first and second valves.

Advantages and disadvantages are found; but from our reading of the paper, the advantages overbalance the disadvantages. So much so that towards the end of the communication we find Mr. Warren saying that, with modification in form and method, the Beckton experience suggests that the Congdon principle can be utilized to much more advantage. It has always appeared to us that ascension-pipes, connections, and hydraulics are so disposed in relation to the bench, that their temperatures are substantially increased and maintained by the heat radiation from the latter; and therefore we believe a suggestion made by Mr. Warren would have an excellent effect in this respect. He proposes that the standpipes, instead of leading the gas upwards to a conventional hydraulic main, should be terminated above the level of the top mouthpiece; and the gas be led down to a gas-tight trough, formed of concrete below the stage-level, and running the entire length of the bed. The trough would thus function as a hydraulic main (if a seal is to be worked), a foul main, and a Congdon trough. The separating tanks would take the place of the ordinary tar-tower. This would dispense with the whole of the iron-work equipment at the top of the bench. Lighter cross-bracing for the bench would also suffice. It is obvious that this should result in a reduced capital expenditure on the retort plant—estimated by the author at least 15 p.ct. He acknowledges that the suggestion is merely a refinement of Hanson's patent of 1885, and of which Hanson plan the patentee of the Congdon system (shall we say?) naturally does not approve. But the proposal has yet to be tested; and it may be that Congdon, Hanson, and Beckton refinements may, combined, make a better proposition than either the Congdon or Hanson plan standing alone.

Now as to the results of the Congdon system as at present working at Beckton in the manner intended by the patentee. The ammonia results are improved by it; and the oils in the tar are superior to those in the tar in the ordinary hydraulic main. Analyses of the gas from the Congdon equipped settings compared with the neighbouring settings fitted with ordinary ascension-pipes (thirteen samples from each being collected over twenty-four hours), showed that the gas, with the Congdon standpipe, was of 585 B.Th.U., while the gas coming through the ordinary ascension-pipe was of only 504 B.Th.U.—the inerts being 9·54 and 20·27 p.ct. respectively. Mr. Warren says: "The superior calorific power of "the Congdon installation gas is due to the lower percentage "of inert gas contained therein." That is where we come up against a blank wall, just when we wanted to go on. The industry is selling gas now on the therm basis; and the knowledge desired is, what is the total therm value secured from a ton of coal using the Congdon system, compared with the ordinary ascension-pipe. In the opening of the paper, Mr. Warren tells us of the destructive influences of the ordinary ascension-pipes, and of (among other things) gas loss. This being so, we should imagine that the statement that the superior calorific power of the Congdon installation gas is due to the lower percentage of inerts does not tell us the whole tale, when applied to the total of the combustible gas produced per ton by the settings, differently equipped, but using the same coal. It is unfortunate, therefore, that it was not possible to measure the gas from the two systems; and we hope the investigation will not be left where it stands in the paper. If Mr. Thomas Goulden, the Chief Engineer of the Gas Light and Coke Company, will arrange to have definite measurements taken of the gas and tar from corresponding settings equipped with ordinary ascension-pipes and Congdon standpipes, so as to complete the information contained in the paper, he will add to the indebtedness of the gas industry. For correct comparison, an over-all statement of the advantages and disadvantages is required, so that a fair estimate of tangible or financial benefit may be made. It is admitted by Mr. Warren that in extension and reconstruction work, the balance of first cost would undoubtedly be in favour of the Congdon system. It may be, with further information in hand, that conditions would be found in which the advantages of the system—perhaps modified—would warrant even an earlier adoption.

A Tragic Explosion.

APART from the terrific, tragic, and gruesome nature of the explosion at the Badische Anilin works at Oppau, on the left bank of the Rhine, the interest of the British gas industry is drawn to the occurrence because to its professional men the name of the famous works is as a household word. The dead and injured due to the explosion cannot yet be numbered, nor can measurement be made of the extent of the damage to property inside and outside the works. Everything is temporarily a matter of conjecture, even the cause of the explosion itself. A vast amount of work that has meant progress has been done at the wrecked works in connection with, among very much else, dyes and synthetic ammonia; and therefore the work in part has been of a character bearing more or less upon the fortunes of the gas industry. The works had also an output (which it is needless to particularize) that rendered help to the German Army during the war of the one part fair in character, but of the other demonstrating some of the most barbarous uses of scientific knowledge. However, this is the time of peace, when such catastrophes as that which shocked the world last week claim and receive the sympathy of humanity at large, and, in this instance, more especially that of scientific and technical men whose interests pursue corresponding lines. Various theories were put forward during the succeeding days as to the origin of the disaster; some of them patently impossible—such as a large store of sulphate of ammonia having blown up, though sulphate of ammonia (*per se*) is non-explosive. It is likely that the awful disaster had a small beginning, and that the death yielding and destructive work found terrible agency in the accumulation of considerable quantities of chemicals in the neighbourhood. This naturally leads one to reflect upon the propriety of gigantic concentrations of chemical works of this nature. But it is no use speculating; all will hope

that investigation will eventually reveal the truth. Meanwhile, it is just possible that the production of synthetic ammonia at these works will be temporarily stayed. Synthetic ammonia was produced there during the war in ever increasing quantity; and there can be little present belief that the process was directly associated with the disaster.

Revival of Simple Hire Facilities.

Many gas undertakings have not yet revived the business getting practices of simple-hire terms and hire-purchase which were so largely discarded during the times of stringency in the matters of finance and supplies of appliances. In morning papers yesterday, the Gas Light and Coke Company made the announcement that they are now able to resume the supply on simple hire of gas cookers, fires, and water-heaters. The Company also intimate that gas appliances can be purchased on the instalment system or for cash in the case of patterns not let on hire. This announcement will be a lead to restoration by other undertakings who were forced by circumstances temporarily to abandon facilities for householders obtaining possession of gas appliances. The old normal ways of business did much for the gas industry; and those "ways" are wanted more than ever in view of present internal developments in gas manufacture and the outside assistance that is being rendered by the publication of information as to the value of an environment unpolluted by smoke.

Gas Coal Position.

Although inquiries for gas coal were reported at the end of last week to be somewhat stronger, buyers do not seem at all eager. In two or three areas, it is stated that pressure is being brought upon the colliery owners to make further concessions in price for gas coal. In Northumberland and Durham, the owners are not showing any disposition to comply further; while from the Scottish districts it is reported that "considerable cutting of prices is noticeable." Of course, the possession of good reserves at most works have placed gas undertakings in a stronger negotiating position. Larger supplies of Yorkshire screened gas coal and nuts are being taken; but there is still the greatest reluctance to contract forward, except for short periods. Stating that in respect of Durham and Northumberland, the demand for gas coal is wholly inadequate to absorb the normal output, the "Iron and Coal Trades Review," says: "The collieries decline to make further reductions; and Wear specials are steadily quoted at 30s., New Pelton, Holmside, at 28s., and second-class qualities—such as West Leversons, Deans Primrose, Washington, Leversons Wallsend, Pelaw Main—at 25s. Unscreened coking coals are in moderate request at from 24s. to 25s." It is also learned that Italian Gas-Works are contracting for British supplies. The Milan Municipal Works, for instance, have contracted through an Italian firm for 40,000 tons of Holmside or Thornley gas coals to be shipped during September to December. Another contract is for 10,000 tons of Durham gas coals (Holmside or similar) to be delivered to the Turin Gas-Works over the next three months. From other directions, too, inquiries for gas coal shipment are growing stronger.

Gas Coke.

With stocks low and colder weather approaching, some gas-works are able to report a quick disposal of their coke, though at considerably reduced prices, compared with a period not greatly removed from the present. The coalowners are, through the costs of production, holding-out for the maintenance of, or very slight concessions upon, present prices for coal; and to an extent this is better for the coke market. Quotations for coke for export are, in fact, going up, though for the gas variety they are not anything like they were a year ago. In August, 1920, 112,818 tons of gas coke were shipped, with a value of £887,744, or not far from an average of £8 per ton. In August this year, only 20,626 tons were exported; and this quantity is valued at £28,438, or an average of about £1 7s. 6d. per ton. There were only 18,635 tons of "other sorts" of coke shipped last month; and the value is put down at £50,186, or about £2 13s. 10d. per ton. In August last year, with the shipments of "other sorts" at 62,327 tons, and value at £424,693, the average value was not so good as that for gas coke. In the eight months, 239,913 tons of gas coke have been exported, with a value of £592,800. In the corresponding period of 1920, 558,093 tons of gas coke were exported, with an aggregate value of £3,250,134!

New Model Bill.

A new Model Gas Bill is badly required; and there is promise of one for the new session. It seems that the Lord Chairman and others have been busy on clauses, &c., for incorporation in it. The National Gas Council have submitted some. There is no question about the clauses requiring complete overhauling. The Gas Regulation Act has rendered some of them absolutely obsolete, and new ones are necessary. Then there have been developments apart from the Gas Regulation Act; and so the additions should be of interest. While on this work, perhaps the Lord Chairman will consider and eliminate the one-third restriction in regard to secondary products purchase, which is altogether opposed not only to the result of the general inquiry that was made into the subject by a Joint Committee of both Houses of Parliament in 1912, but is a restriction to the operation of economic laws. The whole country has been referring with contempt to the control and restriction put upon industries by the Government during the war. There was no doubt some necessity for a measure of control then; but it has been carried too far, both in respect of extent and time. In this one-third condition, there is a piece of restrictive control that is utterly hostile to the best economic advantage being secured by many gas undertakings. Look, for instance, at the advantage that Johnstone and other gas undertakings derive from the purchase by the former from the latter of tar exceeding in amount more than one-half the Johnstone production, and producing refined tar, creosote, and naphtha. [See *ante*, pp. 598 9]

Non-Return Valves and High-Pressure Air.

The risk there is where high-pressure air is employed in conjunction with gas supply of getting an explosive mixture in places where the consequences may be not only uncomfortable, but disastrous, has led the National Gas Council to press for a clause the adoption of which will be a protection to gas suppliers, by enabling them to insist on the provision of an efficient non-return valve or other appliance for preventing the admission of high-pressure air to service-pipes or mains through which gas is supplied. A form of clause already appears in the Spenborough District Council Special Order and in the Draft Special Order of the Cambridge Gas Company. When, however, these Orders were in preparation, the whole area of obligation in respect of the matter had not been surveyed; and it must be admitted that the clause of which we give the text in other columns, which represents the final result of deliberation, is much more comprehensive in form and obligatory effects. There is satisfaction in having secured recognition of the importance of the subject in the Special Orders mentioned; it is still more gratifying to be given to understand that the clause as published to day will find inclusion in the new Model Bill.

Joint Benzole Research Committee.

The appointment of a Joint Research Committee by the National Benzole Association and the University of Leeds, for the purpose of carrying out research into the production and use of benzole, is an interesting development. One of the best ways to put this country in a strong position with regard to the home production of light oil and motor spirit is to investigate the chemical possibilities of, and to utilize to the fullest advantage, the bye-products obtained from coal. The names of the members of the Joint Research Committee were announced last week. The appearance of that of Prof. John W. Cobb, and his connection with the utilization of oxygen in gas production, reminds of the reference made by Mr. W. Newton Booth, in the William Young Memorial Lecture, to the production of cheap oxygen, and to its various uses in connection with gas making and utilization. He alluded to its employment for producing high-temperature gas-flames, and to the question of the possibility of the purification of gas by similar means. He proceeded: If this should ever prove feasible, the actual supply of such commodities as liquid methane would naturally follow; and the difficulty of using coal-gas products as motor fuel would be overcome. By the use of a suitable thermally insulated container and a special evaporator, coupled to a small gas bag (such as became so common during the war), it should be possible to adapt an ordinary petrol-engine for its

use. Liquid methane has a specific gravity of 0·415—*i.e.*, it weighs slightly more than half the weight of petrol, and its calorific value of nearly 25,000 B.Th.U. per pound is much higher than petrol. Mr. Booth acknowledged that such a radical departure from established methods bristles with technical difficulties. This is a matter that will possibly come within the ambit of the new Committee's research.

Reduction of Rates.

Local authorities are responding in some areas to the increasing resentment of the public over the large ascent of the rates. Partially the ascent could not be avoided, owing to the rise in the costs of materials and labour. But these are falling; and the public are looking for a decline in the rates. A start in the backward movement is being made in some areas; but it is only a small one. Something more will have to be done before the public are convinced that the local authorities mean serious business. The latter are moving cautiously; and they allow no ground for hope that reduction will be continued or even maintained. The public, however, will spur them on to a proper recognition of their responsibility in the matter. The greater the application of the spur (so long as it does not interfere with local efficiency, and is effective) the better pleased will be such large ratepayers as gas undertakings.

Unemployment and Productive Works.

A paragraph that appeared last week mentioned the scheme for relieving unemployment, which proposes Government assistance in the carrying-out of public utility works. Since then the Ministry of Health has issued a circular-letter to local authorities, supplying instructions as to the procedure to be adopted. Schemes are to be prepared as expeditiously as possible, and submitted in duplicate to the Ministry of Health, with plans, detailed estimates, and all necessary particulars, together with a copy of the resolution of the local authority directing application for sanction to the necessary loan. How far a scheme is revenue producing and non-revenue producing is to be specified, together with an average estimate of the number of men who will be employed and the probable period of their employment. The earlier the period begins, the better. The rate of wages for unskilled labour, where the local authority undertakes the work by direct labour, should (it is suggested), for a probationary period of six months, be appreciably lower than the full district rate prevailing for unskilled labour in the area.

North of England Gas Managers' Association.—The autumn meeting of the Association will be held at Waverley Café, Whitley Bay, on Thursday, Oct. 6, at 1.45, when the President (Mr. F. C. Willis, of Tynemouth) will deliver his address. There is also to be a paper by Mr. S. Shadbolt, entitled "Some Reflections on the Recent Coal Strike." After the meeting, the members will be conveyed to the works of the Tynemouth Gas Company, where tea will be provided on the invitation of the Directors.

Large Gas-Engines.—For the South Chicago works of the Illinois Steel Company, four large gas-engines are being built in Milwaukee. They will be operated on waste gases from the blast-furnaces; and it is said that by using these waste gases directly in the cylinders of the engines, twice the amount of power will be produced as it would be possible to obtain by burning the gas under boilers, to generate steam for the purpose of running steam-turbines or steam-engines. The gas-engines are of the twin-tandem type, with four double-acting cylinders, and having a maximum rating of 500 B.H.P. at 83½ R.P.M., fitted with generators of 3600 kw. capacity.

Creosote for Timber Preservation.—A specification has been issued in pamphlet form by the British Engineering Standards Association for the use of creosote for the preservation of timber. The specification covers the requirements of creosote suitable for the treatment of railway sleepers and for telegraph, telephone, and hangar poles, and for similar purposes. The clauses of the specification include a description of the substance and limits for specific gravity, fluidity, water-content, distillation, tar-acids, and matter insoluble in benzole (benzene). These are followed by an addendum governing the supply of Scotch creosote, and appendices giving the necessary tests. This subject has engaged the activities of the Association for some time; and the Committee under the chairmanship of Mr. W. W. Grierson (Engineer-in-Chief of the Great Western Railway) has had the co-operation of Government departments and of many industrial and scientific organizations, in addition to a number of railway companies. The pamphlet can be obtained from the Secretary of the Association, No. 28, Victoria Street, S.W., price 1s. 2d. post free.

PERSONAL.

There were eighteen applicants for the vacant managership of the Letterkenny (co. Donegal) Gas-Works; and on a final vote being taken the Urban Council appointed Mr. M. KELLY, of Trim (co. Meath.)

In memory of the late Mr. J. DUNCAN ROYAL (who was General Manager and Secretary to the Watford Gas and Coke Company), a handsome silver trophy, named after him, has been subscribed for by members of the Watford Rifle Club, and will be shot for annually.

At St. Thomas's Church, St. Annes, on the 23rd inst., Miss AMY MACKAY, daughter of the late Mr. John Mackay, a member of the firm of Messrs. Alder & Mackay, of Edinburgh and Bradford, was married to Mr. Alex. Cartmell, third son of Sir Harry and Lady Cartmell, of Elm Lodge, St. Annes, and Preston.

OBITUARY.

Keen sympathy will be felt by a wide circle of friends with Mr. JOHN TERRACE, Chief Engineer to the South Suburban Gas Company, in the irreparable loss he has sustained through the death, on the 19th inst., of his wife, at the early age of 43 years. This sympathy, it will be noted, was expressed by his fellow members of the Eastern Counties Gas Managers' Association at their meeting last Wednesday. Mrs. Terrace had suffered a long and painful illness. She was ailing when Mr. Terrace came from Grimsby in June, 1919, and underwent a very serious operation in January last year, from which, however, she made a good recovery until pernicious anæmia developed. It was hoped that this had been subdued; but unfortunately, early this summer it re-asserted itself, and its progress was then very rapid. Illness had prevented her taking any part in social life since coming South; but in Grimsby she left a host of friends who greatly appreciated her genuine worth. The interment at Elmers End Cemetery last Friday was preceded by a private service at Mr. Terrace's residence, No. 74, Dacres Road, Forest Hill, S.E. Included among the many expressions of sympathy received by Mr. Terrace have been a number from the co-partners of the South Suburban Gas Company, who sent some beautiful wreaths to the funeral.

MR. A. CANNING WILLIAMS'S RETIREMENT FROM EDINBURGH.

His Future Activities.

IN May last, owing to the dissolution of the Edinburgh and Leith Gas Commission, consequent upon the amalgamation of the two towns, Mr. A. Canning Williams who had for ten years filled the office of Treasurer of the Commission, severed his official connection with the gas industry, with which he has been associated for more than thirty-five years.

Mr. Williams's career began in the Blackpool Gas Department, then under the management of the late Mr. John Chew. Some years later, he obtained a post with the Scarborough Gas Company, and in 1895 was appointed Accountant of the Company, with full charge of the general office. In 1904, he was the successful candidate for the position of Secretary and Accountant of the Reading Gas Company; and in 1910 he was elected Treasurer of the Edinburgh and Leith Gas Commission.

Mr. Williams has paid special attention to gas-office organization and accountancy; and, by introducing labour-saving methods, he was able to effect many economies in the undertakings with which he has been connected, and in those where his advice has been sought. He has also had a large amount of experience in the raising of capital. Being too young to retire into private life, Mr. Williams has recently taken up his residence near London, and is prepared to act in a consultative capacity on the financial and office side of gas undertakings. He has been led to this step from personal inclination backed by the advice of his friends, and in the hope that his long and varied experience may be usefully employed. Mr. Williams is a Fellow of the Chartered Institute of Secretaries and is an Honorary Member of the Institute of Municipal Treasurers and Accountants (Incorporated).

Captain Alexander James Corse-Scott, the late Chairman of the Southampton Gas Light and Coke Company, left estate of the gross value of £10,140.

At the ninth meeting of the Refractory Materials Section of the Ceramic Society (to be held at the Institution of Mechanical Engineers, Storey's Gate, S.W., on Thursday and Friday, Oct. 6 and 7), the "Reversible Thermal Expansion of Silica" will be dealt with by Prof. J. W. Cobb and Mr. H. S. Houldsworth; and, among others, Sir A. Duckham and Dr. E. W. Smith will take part in a "Symposium on Gas Firing." In connection with the meeting, a visit has been arranged to the National Physical Laboratory.

BRITISH COMMERCIAL GAS ASSOCIATION.

TENTH ANNUAL CONFERENCE IN GLASGOW,

Tuesday, Sept. 27, and Wednesday, Sept. 28.

PRESIDENTIAL ADDRESS OF MR. D. MILNE WATSON, M.A., LL.B.,

President of the National Gas Council and Governor of the Gas Light and Coke Company.

We meet to-day on the occasion of the tenth annual meeting of the British Commercial Gas Association. It is a particular pleasure to me, as a Scot, to be President of the Association when the meeting is being held in Glasgow, the commercial capital of Scotland. Glasgow has long taken an interest in the Association; and in this, as in other municipal affairs, she has shown herself a model Corporation.

The annual meetings of the Association have always been interesting and important; but this meeting has an added importance as being the first held since peace was officially declared, and since "D.O.R.A." has come to an end. And it is especially fitting that it should be held here in Glasgow, with our friend Bailie Paxton to welcome us as Lord Provost, seeing that but for the outbreak of war we should have met here in the autumn of 1914 under his presidency.

During the seven years that have elapsed since that day in August, 1914, which threw into chaos every field of human activity, we as a nation have been living under the stress of war or its consequences; and this has been constantly reflected in the work of the Association. Now to-day we find ourselves at a new starting point. On an occasion such as this, therefore, it would seem fitting for the Association to review the past and to consider the future.

WAR-TIME CONDITIONS.

During the war the Presidents from time to time have been able to make statements as to the current activities of the Association; but their remarks have been naturally of work under war-time conditions and limitations. It is now possible to speak of our work untrammelled by war conditions. I do not, however, wish it to be thought that because "D.O.R.A." is dead, and officially the war is at an end, we are therefore back into pre-war conditions. But we are now entering upon a new period which may be regarded as normal in a post-war sense.

Behind us lie the war and some of the greatest industrial disputes which the country has ever experienced, and the fear, I think I may say, of a violent constitutional revolution. But for all this, we live in a world still sorely troubled and disturbed, still restless and dissatisfied and disillusioned. Disillusioned, because the wild impracticable hopes that were engendered by the war of an imminent "new heaven and new earth"—where, in particular, less work by each was to produce a better standard of living for all—have not been realized.

Now it is as necessary for us as a nation to get over this disillusionment as to get over the war—indeed the one is a necessary precedent to the other.

THE INDUSTRIAL SITUATION.

In this connection, may I say how gladly all of us on the employers' side in industry welcome such a letter as that of Mr. Philip Snowden to "The Times" last week? In that letter, Mr. Snowden says: "There is only one source from which wages can be paid; and that is the national product. The larger that product is, the larger the wages"—I would rather say the real earnings—"of labour will be; and the larger the product, the cheaper the cost; and the cheaper the cost the larger the trade. Is there," Mr. Snowden asks, and in asking appeals for, "statesmanship enough among the leaders of industry and the leaders of labour to organize the production on these principles."

Speaking for a not inconsiderable industry in this great industrial centre, I unhesitatingly endorse this appeal with all the emphasis I can, and assure Mr. Snowden and those on whose behalf he speaks that we are at one with him in his assertion that "those nations secure supremacy in trade and commerce which have a well-paid and good-conditioned body of workers." And as we have striven in the past, so we are prepared now to help in every possible way to secure that object for the country, once the fundamental laws of economics are recognized, as he recognizes them, by the workers and their leaders as a whole.

As I have said, we are still in troublous and disturbed times. But we have won through still greater troubles and disturbances; and there is light even now in the sky. So let us be of good heart; but let us also face the facts, and not delude ourselves with vain hopes and empty phrases.

THE PRESENT POSITION.

We find ourselves as a nation in the condition of a convalescent recovering from a serious operation and subsequent debility. We are getting back to the normal gradually, but to very different conditions from our former state. It is these altered conditions which we have to face and to examine. The question to-day which is before the nation is: "How are the new conditions to be faced?" And we, as an organization, have the same problem before us.

In this connection it will be interesting to see how far the ideals of those who founded the Association apply to present-day problems. The Association was founded in 1911 by men such as Sir Corbet Woodall, Mr. Edward Allen (now no more with us), and others, many of whom I am glad to see here to-day. Now the gas industry had then been in existence for just a century, and, like other old institutions, had come to be regarded by the public as somewhat old-fashioned. In some quarters, at any rate, it was inclined to accept this view as a correct and inevitable description of its state; for, I believe, many both inside and outside the industry considered that gas was destined to be ousted in course of time by its younger competitor electricity. There were, however, far-seeing men at that time who never took this view, and who saw that a brilliant future was possible for the gas industry if it but kept abreast of scientific invention, and adopted modern methods alike of manufacture and of commerce, and thus equipped made known, effectively and persistently, its many advantages to the public. These men had been pursuing these ideals each in his own company or corporation; but it was constantly borne in upon them that such individual efforts were producing much smaller results than would be the case if they concentrated their energies and formed themselves into one Association, whose duty it would be to promote and defend the commercial interests of gas, to study and discuss modern methods of business development, and to promote throughout the industry a higher standard of performance in that "service to the community" which is the basis of its existence and the hope of its future.

THE EARLY WORK OF THE ASSOCIATION.

The first efforts of the Association were directed to bring the many advantages of gas to the notice of the public. To this end they employed many means—advertisements in newspapers and other publications of general circulation, literature of all descriptions both for national and for local use (of which I may mention specially the invaluable "A Thousand and One Uses for Gas") issued by the Association, information disseminated and articles furnished to all sections of the press (general, technical, and professional), the correction of inaccurate statements in the press and in technical publications, the provision of accurate data for teachers, writers, lecturers, and readers of papers on subjects having relation to the use of gas, and district conferences at which questions connected with gas supply were discussed. By these and other means the Association aimed at securing the widest possible knowledge of gas among all sections of the community and especially at ensuring that (in Sir Corbet Woodall's words, from the first presidential address which was delivered by him at Manchester in 1912) "Government officials, architects, school teachers, sanitary authorities" (that is, those who help to create public opinion in these matters—in which I would include the medical profession as a whole) "should never be allowed to remain in ignorance of the virtues of gas."

In 1913 (as the result of a meeting held on the occasion of the Manchester conference to which I have just referred) a great National Gas Exhibition was held in London to celebrate the centenary of the industry and the jubilee of the Institution of Gas Engineers, in which the "B.C.G.A." actively co-operated, and which gave a great impetus to the industry.

This whole campaign of co-operative publicity and service development did good in other ways. It made the men connected with the industry (and not least the non-technical administrators—the chairmen and members of boards and committees) more interested in their work as they found themselves part of a living and progressive organization. Gas-salesmanship became scientific in the fullest sense—based on accurate knowledge alike of what the industry in particular has to sell, and of the principles on which true salesmanship is based in every industry; and the public had it brought home to them that gas in its various applications could contribute in manifold ways to the amenities of life, the saving of labour, and the productivity of industry.

It has been claimed by some that this result could have been achieved merely by attractive showrooms and by cheaper gas; but the attention of the public must be first directed to the possibilities of gas before they will take the trouble to visit showrooms or take an interest in its price. You cannot sell an article merely because it is cheap; you must first make the public feel a need for the article—and even then, it should be added, there must be

provided with the cheap article good service in the widest sense of the term if maximum permanent business is to be secured.

Happily, the great mass of the industry decided ten years ago in favour of co-operative publicity work in all its branches—and the percentage of those supporting it with funds has been steadily increasing ever since in spite of the war—with the result that the public interest was aroused and, largely through the means of these efforts, gas came to be regarded not as old-fashioned, but as one of the first requisites of modern life. The public were surprised to learn, for the first time, to what a variety of uses gas could be put in the home, and that there were very few trades and industries in the processes of which it did not take a part. I may here mention that it has been ascertained that gas is used by no less than 4000 different branches of trade and industry, with resultant economy, increased convenience, and improved quality and quantity of output.

Another aim of the Association, and one which has in steadily growing measure been realized, was to provide a central Bureau of Information for the industry on its commercial side. This enables it frequently to render valuable service to individual undertakings seeking assistance respecting special uses of gas or requiring help to combat some particular attack from without.

WAR-TIME ACTIVITIES.

From 1914, however, the activities of the "B.C.G.A.," like everything else, had to be subordinated to the winning of the war. It was not long before gas undertakings were hampered by restrictions as to supplies of coal, the strict curtailment of lighting, a growing scarcity of gas burning and measuring apparatus, and a shortage of labour for its installation and maintenance; and the time finally came when gas-salesmen were chiefly occupied in the task of restricting the consumption of gas by the public rather than of increasing it. [I need hardly remind my hearers of the large amount of work thrown on the industry by the famous Household Fuel and Lighting Order, in connection with which the "B.C.G.A." rendered much assistance to the industry. May we never see its like again!]

Through all these vicissitudes, however, the "B.C.G.A." did not give up its propaganda work, but adapted and re-adapted itself rapidly to the new and ever-changing situation—ever aiming at helping the industry to serve the nation well and truly. Debarred from its usual activities, it began a new form of educative publicity connected with national economy in fuel and food—securing for its literature on these subjects the stamp of Government approval; and with an eye specially to the future, concerned itself at the same time more actively than before with the creation of sound professional and public opinion on the relation of the utilization of gas to the problems of national health and public welfare.

COAL CONSERVATION.

So soon as material was available, the Association also set itself actively to combat the erroneous impressions created on the public mind by the publication of certain reports dealing with coal conservation and electricity supply, and by the use made of these reports by politicians engaged in fashioning visions of the imminent millennium—a task which is by no means ended yet, for truth is proverbially handicapped in the pursuit of the false.

It may, therefore, not be out of place to reiterate here the main points that have been established as to the relative effects upon the nation's coal resources of converting the potential heat in coal into electrical energy or into gas for the purposes of distributing that potential heat to those requiring fuel, as distinct from light or motive power. From the point of view of coal conservation, there is no practical difference between gas and electricity when used for lighting or power purposes. But when it is heat for heating, cooking, and furnace purposes that the consumer needs, the case in regard to coal conservation as between the two sources of heat supply is very different. Careful inquiry into this subject made by Sir Dugald Clerk, Professor Smithells, and Professor Cobb, resulted in their presenting to the Institution of Gas Engineers a report (which has never been seriously challenged) that sets out, among other conclusions, the following salient facts:

1. The average (not the worst, but the average) electric generating station of to-day destroys coal containing 100 heat units in the process of delivering to the consumer 7 heat units in the shape of energy—a loss of 93 p.ct.

2. The most efficient generating station of to-day shows a loss of 88 p.ct., delivering to the consumer as energy only 12 heat units out of every 100 in the coal burnt under its boilers.

3. The best result anticipated for the suggested "super" stations (but never yet realized in practice at any existing station, and there are some large units in use) is an efficiency of only 18 p.ct.—82 heat units lost in generation and distribution for every 18 units delivered to the consumer.

4. Out of every 100 heat units in the coal carbonized at the "good practice" gas-works of to-day (in round figures) 50 are returned to the solid fuel market as coke; 5 are recovered as tar; 22·5 are lost in manufacture and distribution; and 22·5 reach the consumer as gas. So that out of 100 heat units in the coal carbonized, 77·5 are delivered to the community and only 22·5 are lost; while out of heat units that do not reappear after the process of carbonization as anything other than gas (22·5 out of 45 =) 50 p.ct. are delivered as gas to the consumer.

5. In the gas-works of the future it is possible that coal will be as completely as possible gasified, and that 75 heat units out of every 100 in the coal treated will be available for distribution as gas, as against 18 out of 100 available if the distribution be in the form of electric energy.

6. After allowing in both cases for all losses in transmission and utilization—that is, after giving electricity credit for its somewhat higher "efficiency of utilization" than gas—there would be involved in the doing of equal heat work for the consumer the destruction of four tons of coal at the electric generating station of to-day, as compared with one ton at the gas-works of to-day, or three tons at the super-station of the future, as against one ton at the gas-works of the future.

7. To give the gas consumers of to-day equal service to that rendered them for a destruction (net) of 10 million tons of coal, the electric generating stations of to-day would destroy 40 million tons and the "super" stations 20 million tons at least; and in so doing they would destroy all the valuable bye-products recovered when coal is carbonized.

8. To displace the 40 million tons of coal now used for domestic fuel by gas (these are figures deduced from Sir Dugald Clerk's data and the Coal Controller's estimated gas equivalent of coal for fuel purposes), a net destruction of only 30 million tons would be involved if gas carbonized at the works of to-day were used; whereas if electric energy were employed, 120 million tons would be destroyed at the generating stations of to-day, or 60 million tons at the super-stations, if they proved as economical in coal consumption as promised.

WASTING OUR CHEMICAL WEALTH.

These are very conclusive figures from the point of view of coal conservation; and I would emphasize the fact that if coal is burnt at an electric generating station, all the valuable chemical bye-products of carbonization are lost to the community just as much as if the coal were burnt in our grates or furnaces.

I am aware that there has been a great deal of talk about the possibility of first carbonizing the coal and recovering the bye-products, and then utilizing the gaseous energy to generate electric energy for distribution. But this has never been carried out on any large working scale.

THE ASSOCIATION AND ELECTRICITY.

One of the most important services rendered by the Association to the industry was in watching closely the interests of gas in connection with the establishment of national kitchens, and securing the withdrawal of erroneous statements favourable to the use of electricity for cooking in these kitchens which had been published in an official handbook. Here may I just remark that this Association, though essentially pro-gas, is not an anti-electricity organization. We only fight when we are attacked—and not always then, except by the effective though indirect way of reiterating the facts about gas and what it can do for the community. We believe there is ample room for us both in the service of the nation. All we ask is a fair field and no favour.

RESEARCH WORK.

Other directions that may be mentioned in which the energies of the Association found useful occupation during the war include the inquiry into the use of gas for motor-traction purposes—in connection with which the enterprise of the City of Edinburgh should not be forgotten; practical research work on the alleged effect of gas-heating on pianos; of gas lighting on coloured fabrics, organs, and mural paintings; and of gas products on leather—the result of which in every case was to exonerate gas from blame and to determine the true cause of the trouble; scientific research on the comparative hygienic advantages of heating by radiation and heating by hot air; and the endowment of independent research on the comparative merits of various fuels for domestic purposes.

WORK IN THE SCHOOLS.

Through the whole period, moreover, an active campaign was conducted among teachers, through the publication of "Notes for Lessons on the Manufacture, Distribution, and Utilization of Gas," and their scholars, by means of annual essay and drawing competitions, to ensure that the rising generation should start domestic and industrial life with a general knowledge of the possibilities and advantages of gas. This branch of the Association's work, which is laying foundations for the future prosperity of the industry in no uncertain fashion, deserves to be more widely realized and valued than it has been, and calls for the active co-operation of every gas undertaking in the country. This will shortly be facilitated by the publication of the "Notes for Lessons" in collected form.

Steps were also taken during the war to organize a department, since launched and doing much useful work, to render direct service to individual undertakings in the planning and execution of local sales development work, and also in organizing the machinery of service to the public on the most economical and efficient lines.

POST-WAR ACTIVITIES.—HOUSING.

Since the armistice the Association has devoted its energies very largely to two closely related problems—housing and smoke abatement. But for the persistence of its advocacy, by every form of publicity and by the repeated presentation of the case for gas before the housing authorities and the Ministry of Health; but for the fight waged at the Ministry for reasonable financial assistance towards the enhanced cost of installing gas in houses to-day; and but for the assistance rendered to individual under-

takings in their negotiations with local authorities and Whitehall —gas would have had a much smaller share (and on much more unfavourable terms) in the provision of light and heat in the houses that are at last being built in the country, than it has secured. And this share is even now substantially less, and the terms on which the business is being secured are considerably more unfavourable, than they should be, and would have been, had the matter been dealt with in all cases by housing authorities having no association with municipally-owned electrical undertakings. The cynical disregard of financial considerations in the case of some municipalities responsible both for housing schemes and for the supply of electricity, and the apparent powerlessness of the Ministry of Health to restrain such authorities from wasting public money in this fashion, constitute a scandal of no small magnitude, even in these days when public finance has become a derision almost everywhere—south of the Tweed, of course.

SMOKE ABATEMENT.

The campaign for smoke abatement—which has received the active support of the Association—has played a considerable part in securing gas in its rightful place in housing schemes. While it is to be regretted that the Government has not had the full courage of the convictions of the Ministry of Health in this matter, there can be no doubt that the adoption and publication by the Ministry of the interim report of the Departmental Committee on the Abatement of Smoke and other Noxious Vapours had a material effect on public opinion. Opinion in favour of cleansing the air of our towns and cities, as we have already cleansed their water supplies and their streets, is still far from being sufficiently awake or assertive; and everyone who appreciates the urgent need of that next step in sanitary reform should welcome and support the work the Association is doing (at this conference and elsewhere) to inform and arouse the public mind.

I have sketched briefly the activities of the "B.C.G.A." since its foundation, throughout which activities it has taken every opportunity for advocating within the industry the true principles of commercial success, which are founded on the ancient principles of honesty, truth, and, to quote the Rotarian motto, "service before self." It is a history of which it has nothing to be ashamed; and I believe it stands higher to-day in the estimation of the industry than it ever did before. This can be proved, I think, conclusively by the fact that not only have its former supporters agreed, notwithstanding the financial difficulties of the times, to raise materially the subscriptions so that the work of the Association can go on untrammelled from want of funds, but that over a hundred additional undertakings have now agreed to pay their share of the cost of this work on the new basis of subscription.

THE FUTURE.

We are now at the beginning of a new period, and the question is, "What part is the Association going to play in the future?" In order to answer this question, however, we must consider the position of the gas industry itself at the present time. I propose to discuss the industry under three aspects:

1. Its position as essential to the nation;
2. Its financial position;
3. What I may call its scientific and commercial position.

THE POSITION OF THE INDUSTRY AS ESSENTIAL TO THE NATION.

After the war had been in progress for a very short time, it was discovered that gas-works were practically the only source of supply in this country of materials necessary for the manufacture of high explosives, and also of the fertilizers which were absolutely necessary if the country was to increase the home production of food and become more nearly able to feed itself.

Financially, the industry did not benefit at all by its indispensability to the nation, because the prices of the vital products it was called upon and was only too ready to supply, were fixed on such a basis as to be entirely unremunerative. The industry, however, has the satisfaction of knowing that it rendered very material services to the country; and it has, as an important asset, the fact that the public now know—and the "B.C.G.A." has played and can play no small part in ensuring that they do know and do not forget too readily—that it is vital for the national existence both owing to its supplies of gas (which enable domestic and industrial processes to be carried on with a minimum of labour) and to such of its bye-products as benzole, toluole, and sulphate of ammonia, which are essential to the production of munitions of war and of food.

Your late distinguished President, Lord Moulton (whose death we all deplore), frequently expressed the indebtedness of the nation to the industry, and said, without qualification, "that it had saved the nation from defeat in the early months of the war."

As it was of vital importance to the nation in time of war, so we submit it is of vital importance to the nation in times of peace. When we consider how the health of the community is, and can be, improved, not only by the prevention of the smoke nuisance, but by the reduction of dirt and drudgery in the home, by the provision of proper heating and ventilation in the home, and by the existence of facilities for convenient and improved cooking; when we look to the desirability of providing the working classes whenever and wherever possible with facilities for enjoying a higher standard of living; when we pay regard to the need for economy in the use of the nation's coal resources and the realization of the store of chemical wealth they contain; and when we realize that in all these directions the gas-works of the country can directly serve the best interests of the community—can we not justly and without a touch of exaggeration claim that the gas industry is of vital importance to the nation in peace as in war?

THE FINANCIAL POSITION OF THE INDUSTRY.

Notwithstanding the great services to the country in regard to supply of fuel, munitions, and food (to which I have just referred), the industry soon found itself in grave financial difficulty during the war. The cost of coal, oil, freights, stores, and labour rose enormously. Many undertakings found their dividends reduced to practically nothing, and their capital depreciated to such an extent that no one would invest money in them, and even the bankers refused advances. Things eventually became so bad that the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, was passed to give temporary and partial relief to the industry. It soon became apparent, however, that no temporary Act would be of any use—2½ p.ct. and 3 p.ct. dividends were not enough to attract capital when the value of money was depreciated by more than half and income-tax was at the rate of 6s. in the pound; nor were such diminished dividends a just remuneration to the proprietors of an essential and established industry when other less important industries were allowed to earn "excess profits" and pay enhanced dividends, and mushroom industries were in a position to make fortunes for their owners. It was not, however, until last summer that the Government could be induced, after much agitation on the part of the industry, tardily to introduce a Bill for the permanent and practical financial relief of the industry. This Bill—now, happily an Act of Parliament, entitled the Gas Regulation Act—gave the Board of Trade power to take into consideration the increased costs and to substitute new standard prices—in other words, to give the industry a chance of earning dividends approximating at least to those paid before the war.

At the same time as these financial problems were being dealt with, there was much agitation going on (some of it quite factitious) as to the quality of the gas supplied. This brings me to my third point.

THE SCIENTIFIC AND COMMERCIAL POSITION OF THE INDUSTRY.

As you all know, formerly each undertaking had its standard quality of gas fixed by Parliament. Some had illuminating power standards, and of late years a few had adopted calorific standards; but all standards alike were prescribed by Parliament. These standards during the war were temporarily abolished, and restrictions were imposed by Orders in Council as to the quality of the gas to be supplied. This naturally led to discussions as to what was the ideal quality of gas which undertakings should be required to supply—especially having regard to the future; and ultimately the task of answering this question was set to the Fuel Research Board, of which Sir George Beilby is the distinguished Chairman. After much consideration and discussion, the answer at last came from the Board that it was impossible to prescribe one particular quality of gas for the whole industry; and it was recommended, in the interests of progress, that each individual undertaking should be given the right to decide for itself the quality of the gas to be supplied by it.

THE GAS REGULATION ACT.

The report of the Fuel Research Board was adopted in principle by the Government, and finally found a place in the same Act of Parliament which gave the Board of Trade power to fix new standard prices for the purposes of the calculation of dividends. This measure became law in July, 1920, and has properly been called a new Charter for the industry. In addition to the powers prescribed above, it gives the Board of Trade power, on the application of any undertaking, to make Special Orders dealing with the issue of capital, amalgamations, and other matters. Further, it compels any undertaking coming under the Act to charge for gas by quantity multiplied by quality, instead of merely by bulk of prescribed quality; in other words to charge by the therm instead of by cubic feet. This method of charging will ensure that the prices charged by all undertakings can be directly compared, as they will all be selling per so many heat units instead of per so many cubic feet which may contain different quantities of heat units in different areas. This is really the only actual gain, because, long before the Act was passed, many undertakings were selling gas on the calorific basis—that is, per cubic foot of prescribed heat value.

INERTS AND CARBON MONOXIDE.

Strenuous efforts were made in certain quarters to get limitations placed upon the industry with regard to the percentage of inerts and of carbon monoxide which the gas to be supplied might contain, and to increase our statutory obligations in respect of the minimum pressure at which it must be delivered. In the event, the statutory requirements in regard to pressure were made to conform with modern practice; but the efforts of what I may call the extremists in this direction were—happily for those who have to pay for gas—defeated. With regard to inerts and carbon monoxide (in other words, water gas) provision was made in the Act for inquiries to be held. Two Committees were appointed by the Board of Trade; and I am pleased to say that, after hearing many witnesses (some of whom appeared on behalf

of the Association), both Committees have now reported that no restrictions should be imposed upon the industry at present. This is highly satisfactory.

During the time preceding the passing of the Act, many independent investigations were made bearing upon the subjects under dispute; and these largely helped to throw light on what were certainly difficult questions to answer. Investigations were carried on, that is to say, not only by the Fuel Research Board at Greenwich, but also by the Institution of Gas Engineers at Leeds University and at the Uddingston Gas-Works; and many valuable contributions were made to the questions under dispute by Sir Dugald Clerk, Prof. Smithells, and Prof. Cobb. You will see from what I have said as to the position of the gas industry that it has now obtained its freedom, and that it is, so to speak, making a fresh start.

THE WORK TO BE DONE.

Now we have to ask ourselves, "What is the work of the Association going to be?" The work that lies before the Association is primarily, as it has always been, to increase business and to combat competition. Never has there been a time when in the future competition was more likely to be severe than now. Gas has its old rival, coal, and its new rivals, oil and electricity, to contend with. In regard to electricity, the competition which has been felt now for many years is likely to be even greater in the future. Parliament is framing for that industry also a Charter. Electricity Commissioners are already sitting; and it is proposed to erect large super-stations which will deliver cheaper electricity all over the country. Now there can be no objection to electricity being supplied cheaply, so long as its cheapness is not the product of subsidy by public money, direct or indirect. But we, as an industry, must be prepared to sell light, heat, and power still cheaper or at least as cheaply. It is true that we are able (and in the absence of cheap water power will I believe continue to be able) to hold our own in heating and cooking without difficulty if we are progressive in our methods and enlightened in our policy. But in lighting and power we have in many fields a most powerful rival. I think that the time may come when gas and electricity may work together in this country as they do elsewhere—each occupying the field where it is most suitable. It has, indeed, already been recognized in many quarters that gas and electricity should work together; but until such a time as this may come about, we shall have to take care that our business is not taken away from us through our negligence or backwardness, and that we are constantly on the look-out to guard and further our own interests.

Now the best way to expand business and to fight competition, as the Association has always recognized, and as all undertakings will be wise to remember—for, be it said with emphasis, the general work of the Association, be it never so skilfully and thoroughly performed, cannot and must not be thought to diminish the need for particular individual work in the districts of every undertaking—and the best way to increase your output and to prevent your competitor from capturing your business, is not by abusing him or decrying his wares, but by giving your customers, actual and potential, in the most attractive and convincing form, the fullest possible information about what you can do for them, and then (having secured their custom) serving them even better than you have led them to expect. In other words, by publicity at its best, backed by service at its best, you can secure all the business that is legitimately yours, and your competitor will have to be a very good man to beat you.

GOOD SERVICE AND GOOD SERVANTS.

May I lay stress here upon the fact that you can only give good service by means of good servants. In other words, you must employ a well-educated, specially trained and well-paid staff to carry on your service to the public; and I am glad to know that the Association has at present under consideration the whole subject of education in the industry on the commercial or, as I would prefer to call it, the service side.

Both in regard to publicity and in regard to good service—on which I am glad to say its organizers have always laid so much stress—the Association can render much assistance and save both trouble and cost to every individual undertaking, as well as doing very necessary service to the industry in general. In the latter direction there is still much to be done to inform and keep informed the public, and those who are its guides, in matters of public health and national economies, respecting not only the domestic and industrial possibilities of gas but the bearing of its extended use upon the problems of housing, smoke prevention, coal conservation, food production, manufacturing costs and productivity, and the conservation generally of human life and energy.

Here is indeed scope for much work and ability. The Association has the will and is constantly increasing its capacity to carry on the work. To do it thoroughly and adequately, necessarily costs money; but when what it has in the past done with the means at its disposal, and what there is call for it to do in the future, are considered fully and fairly, and when furthermore it is realized that in conducting the gas industry on enlightened and progressive lines all engaged in it are performing a real service (indeed, an imperative duty) to the nation of which they are members, I do not think any board of directors or corporation gas committee will hesitate to support whole-heartedly the work of this organization of which I am proud to have been President, and which I commend to you all to-day.

INSTITUTION OF GAS ENGINEERS.

Arrangements for the Meeting on Oct. 11, 12, and 13.

THE following agenda has been issued for the meeting next month of the Institution of Gas Engineers, which will take place, under the Presidency of Mr. Thomas Goulden, M.Inst.C.E., in the Central Hall, Westminster, S.W.

Tuesday Morning, Oct. 11.

The chair will be taken at 10 a.m.

Minutes for the last annual general meeting to be submitted for confirmation.

(1) Opening of the proceedings by the President.

Presentation of congratulatory address from the Institution to Mr. Samuel Glover, M.Inst.C.E., Past President, on his attaining fifty years' service in the St. Helens gas undertaking.

Presentation of the Council's annual report, 1920-21, and statement of accounts for the year ended Dec. 31, 1920.

(2) Discussion on the Fifth Report of the Gas Investigation Committee (Recording Gas Calorimeters).

An exhibition of calorimeters has been arranged in connection with this report. The instruments will be on view in the meeting Hall. The L.C.C. Testing Station, Carlyle Square, King's Road, Chelsea, will be open to the visit of members from 9.30 a.m. till 6 p.m. on Tuesday and Wednesday, on production of membership card. The Beasley, Fairweather, Simmance, and Thomas calorimeters will be shown in operation.

(3) Discussion on the Sixth Report of the Gas Investigation Committee (Blue Water Gas).

(4) Discussion of the Report of the Refractory Materials Research Committee, to be presented by Mr. A. E. Broadberry, M.Inst.C.E., Chairman of the Committee. (i.) The Softening Point of Mixtures of Silica Brick and Clay Firebrick. (ii.) The Behaviour of Clay Pyroscopes and Fireclay Bricks in Coal Gas. (iii.) Note on the Behaviour of Fireclay Brick in Coal Gas.

Tuesday Afternoon, at 3 p.m.

(5) Discussion of paper by Sir George Beilby, F.R.S., Director of H.M. Fuel Research Board, on "Steaming in Vertical Gas-Retorts."

(6) Paper by Mr. G. M. Gill, Chief Engineer to the South Metropolitan Gas Company, on "Carbonization in Horizontal Retorts," and discussion.

(6a) Report of the International Commission on Illumination Conference at Paris, by the Institution's delegate, Mr. Robert Watson, of Doncaster, and discussion.

Evening.

The President and Mrs. Goulden's reception and dance will take place at the Royal Institute of Painters in Water Colours, Piccadilly. Exhibition of pictures by the Royal Society of Oil Paintings. Galleries open at 7.30 p.m. Reception commences at 8.30 p.m.

Wednesday Morning, Oct. 12.

The chair will be taken at 10 a.m.

Annual General Meeting of the Benevolent Fund.

Minutes of the last annual general meeting to be submitted for confirmation.

Presentation of the annual report of the Committee of Management for the year 1920-21, and statement of accounts for the year ended Dec. 31, 1920.

Other business.

Institution Meeting.

After the meeting of the Benevolent Fund, the meeting of the Institution will be resumed.

(7) Paper by the Society of British Gas Industries on "Tar Distillation and Sulphate of Ammonia Manufacture," and discussion. To be presented by Alderman Fred. J. West, Past Chairman of the Council of the Society.

(8) Report of the Institution Gas Research Fellowship: "The Liberation of Nitrogen from Coal and Coke as Ammonia," by Mr. A. C. Monkhouse, B.Sc. (Gas Research Fellow), and Prof. John W. Cobb, C.B.E., B.Sc. (Livesey Professor), and discussion.

Wednesday Afternoon, at 3 p.m.

(9) Report of the Life of Gas-Meters Committee to be presented by the President, and discussion.

(10) Paper by Mr. J. G. Taplay on "The External Corrosion of Services and Mains," and discussion.

Election of honorary members, scrutineers' report, place of meeting next year, and votes of thanks.

Thursday, Oct. 13, Morning and Afternoon.

Visit the East Greenwich works of the South Metropolitan Gas Company, and luncheon (at 1 p.m.) by invitation of the President (Dr. Charles Carpenter, C.B.E., M.Inst.C.E.) and Directors of the Company. (Replies to be sent to the Secretary of the Institution not later than Oct. 4.)

Visit H.M. Fuel Research Station, which adjoins the South Metropolitan Gas-Works, by invitation of Sir George Beilby, F.R.S., the Director of H.M. Fuel Research Board. This visit occupies one hour. The number of each party of visitors is limited, in order that every member attending may be enabled to hear the explanations of the respective guides in each department.

Parties will be made up as far as may be possible in accordance with particulars furnished by members on the reply form, to be returned to the Secretary not later than Oct. 4.

Special motor coaches will leave the Institution offices, 28, Grosvenor Gardens, Westminster, for East Greenwich, at 10 a.m. Tickets to be obtained from the Secretary not later than Oct. 4.

SIXTY YEARS AGO.

[From the "Journal" for September, 1861.]

Mr. Flintoff's Agitation.—Mr. Flintoff continues the agitation for cheap gas at Newcastle by publishing letters in the papers to show that gas ought to be supplied to the consumers in the town for 2s. 3½d. per 1000 c.ft. He pledges himself, if a new company is formed, to find a contractor who will supply gas to the company at 1s. 5½d.; and he challenges contradiction to his figures in public discussion. He may safely throw down the gauntlet, for he knows full well that there are good reasons, independently of the question in dispute, why it will not be taken up. Without looking closely at his estimates, they exhibit sufficient on the surface to show that they are not to be relied on. A Parliamentary Committee, and not a packed meeting of gas consumers, is the tribunal before which all such matters must, eventually, be brought; and it is there that the accuracy of such estimates as Mr. Flintoff has just formed must be disproved.

Supply of Gas to Public Lamps.—The supply of gas to street lamps is a question that is now being agitated all over the country; and it is eagerly seized hold of to sow discord between gas companies and the public. Wakefield has been for some weeks in darkness, in consequence of the Local Board having required the Gas Company of the town to comply with most unreasonable conditions regarding pressure. At a recent meeting of the Town Council, correspondence between the Company and the Board was read, from which it appeared that the first demand was for a reduction of the price of gas below 3s. 9d. per 1000 c.ft., on the ground that in other towns, less favourably situated for the manufacture of gas, the charge is less. The demand not having been complied with, it was next required that the pressure of gas, during the time the street lamps were lighted, should be 18-10ths at the inspector's office. The only reasonable object for desiring such a pressure throughout the night must have been to increase the illumination; but, on finding that the Gas Company would not consent to such an extraordinary requirement, the sages of the Local Board proposed to diminish the size of the burners from 4 ft. an hour to 3 ft., and they accompanied this proposition with the offer to light, extinguish, and clean the lamps. The Company acceded to these requests; but the question is not yet settled, and, when the dim light of the 3-ft. burners struggles with the darkness of a winter's night, there will no doubt be great clamour against the quality of the gas. The Local Board are stated to have acted under the advice of an engineer; and it is only due to the public that they should make known the worthy who proposes to increase the street illumination by diminishing the quantity of gas consumed.

NON-RETURN VALVES FOR HIGH-PRESSURE AIR.

National Gas Council's Clause.

IN the account which appeared in last week's "JOURNAL" of the proceedings at the meeting of the Central Executive Board of the National Gas Council, it was stated that the Lord Chairman had agreed to the inclusion in the Model Bill of a clause with regard to the provision of a non-return valve where high-pressure air is employed. The clause is in the following terms, and has been slightly amended from the original form, in which it appears in the Spenborough Urban District Council Gas Order, 1921, and in the Cambridge Draft Special Order (which latter Order has not yet been made).

Provision of Valve where High-Pressure Air is Used.

(1) Every consumer of gas supplied by the Company who uses air at high pressure for, or in connection with, the consumption of such gas (in this section referred to as "high-pressure air") shall, if required to do so by the company, provide and fix in a suitable position, and use in a proper manner, an efficient valve or other appliance for preventing the admission of such air into the service-pipe or any main through which such gas is supplied, and shall at all times at his own expense keep in proper order and repair any such valve or other appliance as aforesaid which shall have been provided and fixed, whether upon such requirement or otherwise.

(2) It shall not be lawful for any person at any time after the passing of this Act to commence to use high-pressure air unless and until he shall have given to the company not less than fourteen days' previous notice in writing of his intention so to do.

(3) Every person who at the date of the receipt by him of any such demand note as is referred to in paragraph (*a*) of subsection (5) of this section is using high-pressure air shall within one month after that date give to the company notice in writing of such use; and if within one month after the giving of such notice the company require the consumer giving the same to provide and fix such a valve or other appliance as aforesaid, it shall not be lawful for him after the expiration of fourteen days from the receipt of the requirement to continue to use high-pressure air unless before such expiration he shall have complied with the requirement.

(4) If any consumer shall fail to comply with any requirement of the company or any obligation under this section, the company may cease to supply gas to him, and shall not be under any obligation to resume such supply until the default shall have been remedied to their satisfaction.

(5) The company shall give notice of the effect of the foregoing provisions of this section:

(*a*) (in the case of all persons who at the date of the passing of this Act are consumers of gas supplied by the company) on the demand notes for gas charges payable to the company issued next after that date; and

(*b*) (in the case of any person becoming after the passing of this Act for the first time a consumer of gas supplied by the company) on the first of such demand notes delivered to such person after he shall have become a consumer.

(6) The company shall have access at all reasonable times to all premises supplied by them with gas in or upon which high-pressure air is used, or the company have reason to believe that high-pressure air is or may be used, in order to ascertain whether any such valve or appliance as aforesaid is efficient or is in proper order and repair, or whether such valve or appliance is provided and fixed where necessary

(7) The company shall be at liberty to take off, remove, test, inspect, and replace any such valve or other appliance as aforesaid, such taking off, removing, testing, inspecting, and replacing to be done at the expense of the company if the valve or other appliance be found in proper order, but otherwise at the expense of the consumer.

INSTITUTION OF GAS ENGINEERS.

Visit to the Shipping, Engineering, and Machinery Exhibition at Olympia.

LAST Friday afternoon, in response to an invitation issued by the General Manager of the Exhibition (Mr. F. W. Bridges), a large party of members of the Institution, accompanied by numerous representatives of the London and Southern District Junior Gas Association, visited Olympia. They were joined by members of the Institution of Mining and Metallurgy. In the unavoidable absence of the President of the Exhibition (Hon. Sir Charles A. Parsons, F.R.S.), and of Captain Riall Sankey and Dr. Hele-Shaw (Chairman of the General Committee and Chairman of the Advisory Committee respectively), the visitors, numbering about 200, were received by Mr. Bridges, and entertained at tea.

Mr. Bridges then expressed the pleasure which was felt by the exhibition authorities in welcoming such a representative gathering. He said that a number of important institutions and societies had already visited the exhibition in similar circumstances. The members all had been impressed by the fine display of the products of so many British manufacturers, as he was sure the guests present that afternoon would be.

Mr. Thomas Hardie, M.Inst.C.E., the President-Elect of the Institution of Gas Engineers, proposed, in felicitous terms, a vote of thanks for the arrangements that had been made for the reception of the visitors. He referred to Mr. Bridges' successful association with the gas exhibition held at Earl's Court some years ago, and with the one at Shepherd's Bush in 1913, to celebrate the jubilee of the Institution, under the presidency of the late Sir Corbet Woodall. The resolution was briefly but very cordially seconded by Mr. Frank Merricks, Immediate Past-President of the Institution of Mining and Metallurgy, and carried by acclamation. Mr. Bridges, in acknowledging the vote, spoke of the value of such occasions in enabling engineers engaged in different branches of work to enjoy social intercourse with each other and exchange experiences.

The members then made their way into the main building, and were soon engrossed in an inspection of the various exhibits, of which there are about 300 in all. Reference to those of more especial interest to gas engineers has already been made in the "JOURNAL" [see p. 594], so it is not necessary to describe them here, but it was noticed that the stand of Messrs. Babcock and Wilcox (waste-heat boilers, conveying machinery, &c.), and that of the "Victaulic" pipe-joint, received considerable attention from the members, containing as they do features which are now being so closely studied in the gas industry.

In the evening a lecture was delivered by Captain Walter Broadbridge and Prof. Edwin Edser on "Froth Flotation as Applied to the Preparation of Coal for Coking and Briquetting." The President of the Institution of Mining Engineers (Prof. Sir John Cadman, K.C.M.G., D.Sc.) was to have taken the chair at this lecture. In his absence, Mr. Frank Merricks presided.

Coal-Mine Gas Plant Contemplated.—According to the "American Gas Journal," the establishment of a large gas-making plant at a coal-mine in Southern Illinois to transmit gas to Chicago at a pressure of 300 lbs. is being studied by the Illinois Gas Association. That the realization of the project may be several years off is conceded by the Association, who, however, point out that gas compressed to about 40 lbs. pressure may be sent 50 miles without re-pumping in Northern Illinois, where about 35 villages or towns get their gas service by means of a high-pressure distribution system. "Without this transmission system, many towns and villages could not have a gas service, because the cost of producing and distributing gas locally would be prohibitive," say the Association. "This convenience of gas service can be extended to small places only by the development of large distribution systems and large central gas-making stations for economical production. Enormous possibilities lie before the gas industry in this direction."

ELECTRICITY SUPPLY MEMORANDA.

A LONG letter, delightfully visionary, appears in the "Electrical Review." The writer is Mr. Fred. M. West, who we may as well say now saves any misidentification with a well-known personage in the gas industry by having a different second initial, as well as by the nature of his views. The object of the letter is to present the crude lines of a scheme to supply electricity to all people and for all purposes—not all at once, but progressively through a company formed specially for this great and (most people will think) insane piece of enterprise, especially those people who have already been bitten over the low ratio of revenue to outlay in connection with electricity supply to workmen's dwellings. We are not anticipating that there will be a mighty rush of subscribers to the proposed company; but Mr. West thinks there will be when the glory and far-reaching consequences of his brilliant conception are completely realized. In presenting his idea to readers of the "Review," he starts off by abusing gas—gas which has done so much economically to improve the conditions of occupants of the poorer class houses. This is one respect in which some electricians show a grotesque smallness of mind. They cannot give credit for what gas has done; and yet why are there to-day millions of prepayment gas-meters and cookers in use in the United Kingdom, and only a few electric prepayment meters, and those mostly in flats? Facts have greater weight than the hollow, abusive words of Mr. West. It seems that he had his inspiration on one of the "beautiful summer evenings last week." He was writing on Sept. 10. It was evening, be it observed; and a beautiful summer one. Looking on the backs of houses from the train in which he was travelling, he noticed that about 80 p.ct. of them had their windows closed or nearly so; and "one could look into hundreds of rooms, badly lighted by ill-placed gas-brackets, whose greenish yellow 'glare' showed-up the ceilings they had blackened, but gave little enough light where required. One could imagine the gas-vitiated atmosphere, the clammy heat, like a foretaste of the crossing of the Styx, and realize something of the horrors of gas lighting in these small, overcrowded rooms." Mr. West must have more imagination than sense. The train in which he was travelling was certainly not exceeding any speed-limit, seeing that he was able to make inspection of hundreds of rooms sufficiently to see from the outside that they were badly lighted, that the gas-brackets were ill-placed, that the light given was greenish-yellow, and that the ceilings were blackened; and these lights were going on a beautiful summer "evening"! There is ample room there to make people beware of Mr. West's new scheme.

Electricity for All.

The Scheme.

The scheme is intended to solve the problem of how the "benefits" of electricity—among the "benefits" being, of course, the permanent one of high cost—can be conveyed to those who cannot afford the first expense, or who are not willing to lay out their money on premises held on short or expiring leases. Mr. West believes that a large number of tenants would not object to buy the fittings if the wiring were installed. We have very grave doubts as to this, knowing what we do of the likes and dislikes of prepayment consumers in the matter of expenditure. He is under the impression, too, that many would be willing to pay part of the installation costs if these could be apportioned in relation to their period of tenure. Apart from these beliefs, the scheme is simply this: The formation of a corporation to finance hire-purchase wiring, with the idea of only paying sufficient interest to attract investors who are satisfied with a small return, provided their money is safe and repayable at par. We do not know where investors would be obtained who are to-day satisfied with a small return; and most investors would be inclined, we think, to regard the proposal as too speculative to look upon the investment as a safe one. A further idea, however, is that the corporation should have the support of the whole industry, and all its important members should not only invest a portion of their reserves, but guarantee the scheme according to their means. In other words, Mr. West appears to suggest that reserves should be invested at a rate of interest less than electricity undertakings can borrow money for. We rather incline to the view that the managements of electricity undertakings will consider they could invest their own reserves directly to much better advantage in their own area than through a second party. This finance company, operating through the various supply authorities in the country, would be known as the National Electric Wiring and Banking Company, until someone conceives a better name for the baby. "Its function would be to offer various schemes of hire-purchase wiring on a weekly or quarterly basis, or, taking a broad average, by adding so much per unit." A development would be by adding a fire policy under its agreement; so "eliminating any severe fire office regulations." As to capital, its ultimate figure would be immense; but, to make a start, it is suggested that a hundred of the principal manufacturers and institutions should contribute £1000 each, and guarantee a like amount. It is all very ambitious, and to us it appears to be somewhat foolish and cobwebby in its structure. There is nothing sufficiently certain or tangible about it. But a little daub of attraction is given to it by the intimation that it might be possible to tackle 500,000 installations after the first few months; and assuming an average of ten points per installation, this would make a total of 5,000,000 new points per annum. At an average of 30 watts, this would mean 150,000 KW. Mr. West refers to the scheme as being on the lines of the old National Free-Wiring Company. The "Electrical Review" thinks that the experience of this body is not likely to inspire enthusiasm in the breasts of those who are acquainted with its history. But it adds that its thoughts naturally turn to the Fixed Price Light Company, Ltd., which, after eleven years' operations, have secured some 4000 or 5000 consumers of the artizan class in various supply areas. From this precedent, it is inferred that Mr. West's proposals are not inherently fallacious; and so there is commendation of them to the readers of the "Review." We shall be interested to learn as to the measure of success that the commendation obtains.

Adequate and Suitable Lighting.

The recently issued welfare pamphlet (No. 7) is another of the useful publications of the Home Office. This one is on "Lighting in Factories and Workshops"—a subject which will never be thoroughly worn-out until scientifically arranged lighting is the fashion in all such places. To the expert and student of the subject, the rules and suggestions submitted in the pamphlet are commonplace enough; but it is the things that are commonplace to men who have studied the matter that are so gravely neglected by many of those responsible for the conditions of factories and workshops. There is no doubt about it that it is better to have insufficient lighting so far as the workers' eyes go than an excess of light and an irritating glare. The insufficiency may cause headaches and eyestrain; but it does not promote eye disease. Otherwise our ancestors would have left us a fine heritage of defective organs of vision. The effect of light deficiency upon output and quality of work is also well known to experts, but not generally to manufacturers. The same applies to the fundamental requirements for good lighting. It is all in the pamphlet before us. Adequacy and suitability, glare, and avoidance of shadow are dealt with. But what puzzles us is that, with all this publication and advance, so many electrical men simply wink at transgression of good conditions; and allow it to go on without remonstrance or counsel. They are mere sellers of electrical energy, and not of good lighting. So long as they can sell energy, they care little as to the use to which it is put. This is not a universal form of electrical impropriety, but nevertheless the wholesale examples of bad lighting show that it is common enough. The pamphlet tells of the need of constancy and uniformity of lighting, of flickering or variable light being the cause of irritation and of accidents to operatives, and of the need for the prevention of glare. Yet the flame arc lamp with its flickering goes in, or the gasfilled with its absolute abandon in the matter of glare, without any protection.

Lamp Depreciation.

There is the question as to constancy and uniformity of lighting; and in this connection we read in the pamphlet: "Inadequate illumination is sometimes caused by the diminished pressure in the gas-mains during the period of maximum consumption, and, where the electrical energy is generated on the premises by the installation of a dynamo or engine of insufficient output." Also that "considerable loss of light may result from deterioration of gas mantle and filament lamps, and from the deposition of dust." Under the Gas Regulation Act, pressures are to be at a minimum of 2 in. in all mains and services of not less than 2 in. diameter; and this is ample pressure for all low-pressure lighting. There is not the same provision for a minimum pressure in connection with electricity supply; and the sooner there is constancy of voltage in electricity distribution, the better for users. A great enemy to constancy and uniformity is deterioration of the source of light; and a point which is often overlooked is that with gas the maintenance of uniformity of light is merely a question of attention. The pamphlet tells us that considerable loss of light may result from the deterioration of gas-mantles and filament lamps. Gas-mantles do not deteriorate in the common acceptation of the term. They suffer injury through vibration—more so the upright form than the inverted variety; but so long as mantles are unfractured, burners and globes are kept clean, and the former regulated, there will be no sensible depreciation of light. This cannot be said of incandescent electric lamps. They do depreciate in their light-giving power, and the only remedy the consumer has is replacement and expense. Filaments deteriorate—in the gas-filled lamp quicker than in the vacuum type. The bulbs get blackened on the inside, and obscure the light. There is no remedy for this that a consumer can apply. He must bear the deterioration and loss of light. And with indirect or semi-indirect lighting, there is not only the internal obscuration, but there is the dust that collects in the shade and on the bulbs, and, not seen, is neglected, to the detriment of the general lighting. One may specify satisfactory minimum illumination; but a lighting expert would be required in most cases to go round with an illumination photometer to see whether the foot-candles were those prescribed. When the law compels a minimum illumination for different classes of work, the manufacturer using electric lighting will soon begin to find that his electric lamps will have to be replaced faster than he now deems necessary. It will be a good thing no doubt for his work; and so it will be for those who make and those who sell electric lamps.

Air Pollution and Electricity.

The article in the "Daily Telegraph" by Dr. Saleeby, which was noticed on p. 648 of last week's "JOURNAL," has drawn a letter from "F. Newcomb, Captain," of Boreham Woods, Herts. The Captain is evidently one of those gentlemen who look at things from a single point of view. There are a lot of these individuals going about nowadays. He suggests that the best solution of the air pollution problem is to be found in the methods of Switzerland and Canada. Switzerland has for a considerable time been progressing electrically, and Canada has now decided to embark upon a very ambitious electrical programme. Some figures from Canada inform him that a six-roomed house—including lighting, heating, cooking, cleaning, and laundry—can be run at a cost of 14s. per month. He suggests that "even allowing for possible error in this estimate, it still remains palpably clear that we have a lot to learn as regards electrical development." It is equally "palpably clear" that Captain Newcomb has also much to learn regarding the same subject. The means of electrical generation in Switzerland and Canada are not our good fortune here; and it would not pay us to import electricity from either place. Our own electrical engineers are developing, or are trying to develop, electricity generation in this country, within the limits of their opportunities—perhaps not always upon the right lines, but right according to their individual ideas. If Captain Newcomb can supply us with the water power possessed by Switzerland, then it might be possible to abandon solid fuel for electricity generation; but in existing circumstances, electricity cannot be generated here at a price nor with conservation of our fuel resources that can make it the solution of the air pollution problem. Another silly point in his letter is his reference to "gas fumes." We do not know, but it would be interesting to learn, whether Captain Newcomb is one of those permanent Press letter writers in favour of electricity with whom we have had to deal on previous occasions. They never seem to lose an opportunity for getting in a letter when a peg presents itself; but they either do not appreciate, or they do not care, how ludicrous they make themselves appear to those who know. Their business appears to be with those who do not know, and who can therefore be gulled.

Nearly 500 P.Ct. Increase in Generating Costs.

At the present time prices of current are high; and not a few supply undertakings have had to consider the question of a further advance in view of the losses that have been incurred during the coal strike; and there are other reasons. The money that is now being spent on new plant or replacements is not rendering anything like the old service per unit of expenditure. Therefore, the costs of electricity production are also higher on this account. Several undertakings are now asking authority to charge prices per unit in excess of the 1s. per unit that has lately obtained. Some are seeking 1s. 3d. per unit. Chipping Norton, of course, is not a representative place; but an inquiry has been held there by the Electricity Commissioners into an application for permission to increase the maximum charges to 1s. 3d. for lighting and 7d. for power! The Managing-Director stated at the inquiry that the generating cost per unit has risen from 1·9d. in 1914 to 9·2d. in 1921—nearly 500 p.ct. increase. He also reckoned that to give the shareholders a fair return, the maximum price should be 1s. 5d. per unit. Things have not drifted well for electricity in the small towns.

Doubled Capital Costs.

From Chipping Norton to Manchester (in respect of size) is a far cry. To show how estimates of two years ago for works have fallen far short, it is now announced that the new Barton power station of the Manchester Corporation, which two years ago was estimated to cost £1,810,500, requires an extra sum of £1,466,743 to complete it—thus bringing the total up to £3,277,243, or nearly double the estimate of 1919.

Needy Power Stations.

The Electricity Commissioners are aware that many of the large stations that have been developed during the period of high prices cannot pay for themselves unless they are fully employed. Therefore they are looking very narrowly at applications for borrowing powers as they are received, with the view of ascertaining whether there are any needy stations in the neighbourhood to which a bulk customer would be a boon and a blessing. But there are electricity suppliers who want and prefer to extend their own plant, and so make it more efficient over-all. They do not like this idea of paying expensively for lending a hand, and at the same time missing an opportunity for making their own plant more efficient and more economical. Accrington is one of these. They want £126,850 for extensions; but the Electricity Commissioners have suggested that the needs of Accrington can be well met by Blackburn. Accrington objects. Blackburn established its station when costs were high; and the station is estimated to have cost £800,000, involving an annual charge of £82,000. This can only be met by the plant being fully employed.

Commercial Distribution at 1000 Miles.

According to a report published recently, the General Electric Company, at Pittsfield (Mass.), has been demonstrating that electricity can now be transmitted commercially over a distance of approximately 1000 miles. This wide distribution is made possible by taking the ordinary 2000 volt 60-cycle current, and stepping it up through transformers and hollow wires 4-in. diameter, until it reaches 1,000,000 volts! There is something uncomfortable looking about such a pressure.

IDEAL HOMES EXHIBITION IN GLASGOW.

Attractive Display of Gas Appliances.

THERE is a striking sense of appropriateness in the fact that the annual meeting of the British Commercial Gas Association in Glasgow this week should synchronize with the Ideal Homes Exhibition, which, like its precursors, is being held in the spacious Kelvin Hall of the city, and is under the auspices of the Corporation of Glasgow. With an economic outlook far from reassuring, the motive of the promoters—namely, to stimulate and give emphasis to the demand for homes for the people fashioned on lines of perfection from the standpoints of hygiene, illumination, sanitation, and health—may seem to be something of a fanciful vision not altogether capable of realization in the immediate future. But the Corporation of Glasgow have not erred in keeping well abreast of the period when trade generally will be more prosperous and money more plentiful. The exhibition makes a particularly strong appeal to the feminine mind; but while that is admittedly true, the show in its broader aspects, and very specially on its technical and commercial sides, is not without educational value to the sterner sex.

In several of the sections the gas industry looms conspicuously to the front, with a multiplicity of exhibits illustrating the potency of gas as a valuable heat-giver, as well as an illuminant; while the Glasgow Corporation Gas Department, in a display of more than average comprehensiveness, pay a generous tribute to the hygienic and cleanly properties of gas as a cooking medium. Imbued with the desire to teach the citizens of Glasgow that gas as a medium for cooking possesses many inherent advantages, the Gas Department have not spared themselves to make the stands of an arresting nature. Methods of ventilation are shown by which the gas escapes through a flue built within the actual wall. Furthermore, the fact that gas cooking minimizes labour is abundantly emphasized; and when one sees the many varieties of grates and gas fuel, it becomes obvious that only to the eye of prejudice is the gas-fire less attractive than one of coal. Mr. J. W. M'Lusky, the Gas Engineer and Manager in Glasgow, and his capable staff of technical experts, were very successful in proving that in the ideal home labour is minimized by the use of the gas-cooker, the gas-fire, and the gas-geyser. The Gas Department have retained for the exhibition the services of a lady lecturer.

The Carron Company, an old-established firm dating from 1759, and celebrated during more than a century-and-a-half for the soundness and finish of their work, are responsible for a formidable display of the well-known "Carron" ranges and grates. The firm's specialities in up-to-date appliances are very much in evidence, and included among them, it may be said, are the latest developments in cooking and heating apparatus. The new fireplaces on the Carron Company's stands are peculiarly artistic, and are carried out in the most effective combinations of tiles and metals.

"Who's Who in Engineering."

The directory, edited by Mr. John Ed. Sears, C.B.E., M.A., Assoc.M.Inst.C.E., F.Inst.P., on the "Who's Who" principle, of professional engineers, producing firms, engineering institutions, centres of technical training, research associations, &c., has now reached its second issue, which is evidence of the fact that the first one proved to be of use—as, indeed, it was expected would be the case. The second issue will, no doubt, be of even greater utility; for advantage has been taken in preparing it of a number of suggestions which had been made for the improvement of the book. Even now the Editor does not claim to have reached finality in the big undertaking to which he set himself; but an enormous amount of information has been collected by him, and is included in the publication, which, as he says, is intended to be essentially practical in character, and not a volume adulatory of those represented in it. In order that the book may be thoroughly representative of all branches of engineering, the further co-operation is invited of members of the profession in sending to Mr. Sears any names not found in its pages which they consider merit inclusion in future editions; and this is an invitation which should be taken advantage of. It has evidently been done to a large extent since the first issue; for, in its second issue, the volume has nearly doubled in size. The list of gas engineers included has been largely increased; but there still remains ample scope for suggestions to the Editor in this connection—for which purpose a leaf will be found at the end of the book. "Who's Who in Engineering" is published at Nos. 93 and 94, Chancery Lane, W.C., at the price of 31s. 6d.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Meeting at Bath.

LAST Thursday, on the occasion of the Autumn Meeting of the Southern Association, their President, Mr. J. WESLEY WHIMSTER, welcomed a large number of the members to Bath. Many of them recalled with pleasure the last opportunity their activities offered of visiting this charming city. It was during the presidency of Mr. C. Stafford Ellery (Mr. Whimster's predecessor as Engineer and Manager of the Bath Gas Light and Coke Company) in May, 1910; and a most enjoyable visit then was only shaded by the recent death of H.M. King Edward. At that gathering Mr. James W. Helps, then President of the Institution of Gas Engineers, was present. Mr. Thomas Goulden was unfortunately prevented by his multifarious duties from attending last week; but the meeting was very representative.

The PRESIDENT lost no time in extending his welcome and hospitality to the Association, for he and Mrs. Whimster had arranged to be at home to such members as were lucky enough to arrive the previous afternoon. As a result, they spent a delightful evening—meeting old friends in surroundings far more genial than a hotel lounge.

INSPECTION OF THE GAS-WORKS.

Upwards of sixty members of the Association collected soon after 10 a.m. on the Thursday in the board-room at the works, which are situated about a mile from the centre of the city—fronting the main road from Bath to Bristol. Four Past Presidents of the Association were there—Messrs. Daniel Irving, W. Doig Gibb, C. Stafford Ellery, and Charles F. Botley. Mr. James Paterson, the President of the Midland Association, had come from Cheltenham; and Mr. Walter T. Dunn (representing the Institution of Gas Engineers), Dr. H. G. Colman, and Mr. G. M. Gill were others among the representative gathering. A handy brochure was distributed, giving structural particulars of the works; and the party commenced the inspection under the guidance of Mr. Whimster, ably assisted by Mr. K. G. Gandon (Assistant Engineer), Mr. S. Hole (Chemist), and Messrs. L. L. Miell and A. D. Copp.

At the last visit of the Association, members were informed that in 1909 642 million c.ft. of gas were supplied to 16,000 consumers through 131 miles of mains. In 1920, 877,298,000 c.ft. were sold, and 18,981 consumers were supplied through 142 miles of mains. The gas, of 500 B.Th.U., sells at 1s. 11d. per 1000 c.ft. The bulk of the coal comes from Somersetshire collieries; and during the war, and since, the percentage of ash has been anything between 20 and 30. This is largely owing to the thinness of the seams in the majority of the Somerset pits. However, the saving in freight and a desire to support local industry, coupled with the excellent results obtained, have precluded the Company's going North for more than an occasional lot of coal.

Though additions of interest have been made to the works since 1910, the general lay-out has not been altered from the plan which appeared on p. 430 of the "JOURNAL" for May 17, 1910. The carbonizing plant consists of 31 horizontal settings of eights, heated on the regenerative system, having furnaces on one side only. The latter are fitted with a special type of grate of Mr. Whimster's design, steeply sloping square-section bars being employed. The grate is kept nicely cool, and the fuel just moving. The result is practically complete absence of clinkering. Every eight hours the fires are pricked-up and the ash cleared-out; and this is all the attention they receive. Two Fiddes-Aldridge stoking machines serve for the two pairs of retort-houses. The machine in Nos. 1 and 2 houses has recently been fitted with a new type of push-plate chain, which is now under test. Instead of the usual channel, with push-plates centrally hung, the new chain is formed of a central ram having push-plates hung on both sides. It will effect a charge of 12 cwt. in the 22 in. by 16 in. by 20 ft. retorts; the curve of the latter being well-filled, and ample gas-way being formed by the central subsidence when the chain is withdrawn. The power-house on the south side of the River Avon (which runs through the works) is equipped with a 22·5 KW. 225-volt continuous current E.C.C. generator driven by a 44 B H.P. National gas-engine, the whole installation being in duplicate. The current is led through distributing and control boards in the retort-houses to the motors on the coal plant and to the overhead conductors supplying current to the stoking machines.

The washing and purifying plant is substantially the same as at the time of the last visit. The carburetted water-gas plant, however, has been developed, and now consists of two sets each of a capacity of 1,000,000 c.ft. per 24 hours, together with the usual washers, scrubbers, and water-cooled condensers. Both sets are fitted with dust catchers. The air-blast is supplied by a Sturtevant fan driven by a 30 B.H.P. De Laval steam-turbine, in duplicate. The steam for the generators and turbines is provided by two Lancashire boilers, each 26 ft. long by 6 ft. 6 in. diameter, working at 100 lbs. pressure with Meldrum's forced-draught furnaces fired with coke breeze. The steam is superheated to about 150° Fahr. The coke is elevated to the stage floor by means of a hydraulic lift.

The exhausters are in duplicate—a "Dempster" two-bladed, of a mean capacity of 60,000 c.ft. per hour, and a three-bladed "Waller," passing 80,000 c.ft. of gas per hour. A relief holder and oil-storage tank are situated on the south side of the river; the holder having a capacity of 80,000 c.ft. On leaving the washers and condensers, the gas is passed through a cyclone tar extractor, and a Pelouze and Audouin extractor before going to the purifiers. The purifier boxes, which adjoin the coal-gas purifiers, are four in number, each 30 ft. by 20 ft. by 5 ft. deep, waterluted.

Near the water-gas plant the visitors examined a small rotary pump—Stothert and Pitt, Type No. 3—which is being thoroughly tested on dehydrated tar, and is showing-up very satisfactorily.

The sulphate of ammonia and concentrated ammonia plants are situated on the south side of the river. Liquor is run by gravity from overhead storage tanks to the still, which is capable of dealing with 25,000 gallons of liquor per 24 hours. There are two closed saturators, one acting as a stand-by, and both fitted with steam ejectors. The acid is gravity-fed from two acid-storage tanks in the building; the acid being forced into them from the railway tanks by compressed air. The sulphate is centrifugally dried and neutralized; the process being that devised by the South Metropolitan Gas Company. The finished product contains 25·3 p.ct. of ammonia and 0·75 p.ct. of water.

In the same building is the concentrated ammonia plant; the still heater and the condensers being common to both plants. Opposite the sulphate works are the smithy and fitting shop, over which are the tar, liquor, and water tanks. Under the shops are the power-house and workmen's lavatories, the latter being fitted with baths, lavatory basins, lockers, &c. Adjoining the carburetted water-gas plant is a Wilton tar dehydrating plant of a capacity of 22 tons per 24 hours. The whole of the tar produced is treated in this plant. There is also a benzole recovery plant, which is now out of action.

The plant for high-pressure lighting and distribution, which is in duplicate, is steam-driven. It is housed in the coal-gas exhauster room. Each set consists of two rotary compressors, each compressor having a capacity of 27,000 c.ft. per hour against an outlet pressure of 4 lbs. They are at present worked at a pressure of 70 inches of water, and supply the high-pressure system which runs through the principal thoroughfares of the city for shop lighting, &c., and also the villages of Corston, Newton, and Saltford through Reynold governors. They also are used for boosting gas to a distributing station at Widcombe, an eastern suburb 1½ miles from the works, where there is a 360,000 c.ft. holder. At Widcombe there are two small gas-driven compressors for increasing the pressure at times of heaviest consumption. A well-fitted laboratory is situated centrally in the works, and contains a complete coal-testing plant of a capacity of 2½ cwt.

The tour completed, the parties collected in the board-room for a short chat and refreshment.

NEIGHBOURING WORKS.

Messrs. Aldridge and Ranken and the Horstmann Gear Company, Ltd., had offered to open their works to members of the Association, parties of whom left in cars to inspect them immediately after the gas-works tour.

The Avonbank works of Messrs. Aldridge and Ranken are on the River Avon, and at present consist of an erecting shop divided into two bays, a machine shop, and a smiths' and platers' shop, together with a pattern shop, stores, and offices. Two Crossley gas-engines drive the greater portion of the machinery; while there are separate electric motors for isolated tools. The firm are arranging to purchase the whole of the site; and further buildings will be erected as soon as trade once more reaches a normal state.

Standing in the erecting shop and completed ready for dispatch was an "F.A." stoking machine of the latest type for Garston, Liverpool, and also a coke carriage (Gibson's patent). The latter machine operates on novel lines. Normally the back end of a covered-in trough lined with fireclay swings on a pivot, the front end being raised by wire ropes to the level of the retort to be discharged. The coke coming out of the retort (being pushed from the other end by a simultaneous stoking machine) passes through a bridge-piece into the inclined trough, whence on the higher levels it falls through by gravity into the coke containers or on to a modern inclined quenching table outside the retort-house. On the lower retorts, the push of the stoking machine drives the coke through. The fumes, &c., arising from the coke are thus prevented, so far as possible, from permeating the retort-house. The whole of the machine, including the travelling motion, is electrically-operated. The coke containers, into which the coke is pushed, are surrounded with water, and the coke is thus cooled without

contact. This coke is of superior quality, and from previous experience in Liverpool it should fetch a higher price than the ordinary coke.

The visitors' attention was drawn to the parts of the Congdon scrubber standpipe system in course of construction for the Vauxhall works of the South Metropolitan Gas Company. This apparatus partly washes the gas by ammoniacal liquor immediately it leaves the mouthpieces—thus improving illuminating power, saving all the tar, and keeping the mouthpieces quite clean; and last but not least the trouble and expense in connection with stopped pipes are entirely dispensed with. The firm are also engaged in the manufacture of another "F.A." machine, now in course of erection for the Fulham gas-works; and they recently obtained an order for one of their new central chain five-tier stoking machines for the Portslade works of the Brighton Gas Company. The parts are now being manufactured, but unfortunately are not yet sufficiently advanced for erection. This machine is similar in principle to the one working at the Bath gas-works.

Various parts in connection with a breeze handling and storage plant for the Alliance and Dublin Gas Company were seen in course of manufacture. This plant includes twin-bucket elevators, a push-plate conveyor, and 60-ton steel storage bunkers, with cast-iron shoots for feeding the mechanical stokers of the Stirling boilers. Visitors were also interested to see the model of the original stoking machine invented by the late Mr. W. W. Fiddes in 1902.

Those who had time to visit the Newbridge works of the Horstmann Gear Company had an opportunity of seeing the various models of gas controllers and other automatic lighting appliances which have been developed since the firm—fifteen years ago, as watchmakers in the City of Bath—produced their first controllers. The writer was able to pay a visit to these works earlier in the day, and was immediately struck by the fineness of their work, and not less by the orderliness and the efficiency born of standardization. The firm gained a high reputation during the war as gauge makers; and their machine parts and stamps are masterpieces. Besides their controllers they are working on domestic clocks—various handsome and artistic patterns being on view; and in this line they are meeting with success in combating foreign competition. Their first gas-controller [a full account of which was given in the "JOURNAL," Vol. XCIII., p. 565] was a distinctly scientific instrument, automatically adjusting the times of lighting and extinguishing throughout the year; and this instrument (Type 1) is still a favourite with many gas companies. The need for a controller for hand-setting was quickly felt; and Messrs. Horstmann have since produced two distinct types of such controllers—Types 3 and 3A—each of them being in three distinct patterns for the various types of burners in use. These controllers embody many patented features; and, owing to their all being quick-lighters and having many discriminating and fool-proof characteristics, they are very largely used in some of the largest installations throughout the world. Prior to the war, in common with other makers of scientific clocks, the purely clockwork portion was obtained from various clock factories, and only the patent parts were added in Bath; but the war made it necessary for the whole apparatus to be manufactured at the Company's works. Incidentally, the requirements of the war placed the Company in a favourable position for this class of work, seeing that they were the largest producers of munition gauges in the country (which was suitably recognized by His Majesty's Ministry of Munitions). The development in this department made it easy for them to adopt interchangeable methods of manufacture in their various gas controllers, &c., greatly in advance of anything previously attempted in this country. The visitors were able to see the methods of producing not only the controllers and other lighting appliances, but the machinery, process tools, and gauges, which have all been made on the premises to accomplish this feat. It may be mentioned that standardization is now so thorough that spare parts can be procured by return of post in any of their standard lines, while the mass production thus achieved makes it possible to get an almost unlimited output for the requirements of their home and foreign trade.

In addition to the three types mentioned and the standard patterns in which they are made, there are a very large number of other types evolved from this foundation mechanism for gas arc lighting, for the control of main taps for flats, and for commercial purposes, besides a complete range of bye-pass equipment, and the Horstmann patent atmospheric pilot, to which has lately been added a height adjuster. Several new features have also been devised to meet the requirements of restricted lighting; one very useful feature enabling the operating levers on the dial to be rendered inoperative when desired; so that, should lighting not be required during a period, the controller need not be dismantled or the clock stopped in order to prevent the controller lighting. This feature is particularly applicable where a "moon schedule" is in use. The firm have also adapted the movements of their Type 3A controller for use in pressure-recording graphs, barographs, &c.

LUNCHEON.

The inspection over, motor charabancs were waiting at the works to convey the party to the Empire Hotel, where the Association was entertained to luncheon on the invitation of the Bath Gas Light and Coke Company. Sir PERCY K. STOTHERT, K.B.E., J.P., M.I.C.E., was in the chair, and presided over a well-appointed board. Seventy-four in all sat down; including Mr. S. Fox-Andrews, the Deputy-Chairman of the Company, and Mr. Ellery.

After luncheon, the CHAIRMAN gave the Loyal Toast. He then called upon Mr. W. E. PRICE, who proposed the toast of the City of Bath. In a few apt sentences he voiced the appreciation of the members at being able to see the city, and outlined the many things for which the country is indebted to Bath. He coupled the name of the Mayor of Bath with the toast that had been given. It was received with acclamation.

The MAYOR OF BATH (Alderman J. H. Colmer, J.P.) replied. He said he appreciated the honour of taking part in the proceedings that day. The last time he and the Board of the Gas Company had met, they were assembled at the Guildhall, and he regretted not entirely in agreement. Since then both sides had learnt "what was what." Electricity and gas were both of them necessary commodities; and one could not get on without the other. It was his opinion that, in the near future, electricity undertakings would be stopped emitting black smoke clouds, and that they would look towards gas to help them. Gas undertakings found great assistance in electricity. On behalf of the City of Bath, he thanked Mr. Price for his laudatory remarks. They had a pleasant city, he (the Mayor) too was bound to confess. Many prosperous concerns had grown-up in Bath—among them a gas company whose prosperity must be almost unique. Their balance-sheet was always sound. He had great pleasure in welcoming the Association.

Sir PERCY STOTHERT then proposed the toast of "The Southern Association of Gas Engineers and Managers." Especially as their programme was a full one, he was not, like a voluble person in a recent cartoon, going to be consumed by his own gas! Eleven years ago Mr. Ellery, as President, had received the Association in Bath. On that occasion he (Sir Percy) had proposed the same toast with equal pleasure. The eleven years had been eventful. The gas industry had made great strides, not only regarded from the manufacturing and commercial aspect, but in bringing into closer touch with each other the individuals who composed it. The "B.C.G.A." had been initiated, and the National Gas Council set on foot. These associations had expanded, and effected by closer working conditions the wide progress that had been made. Theirs was a very live Association; and they in Bath felt honoured that Mr. Whimster should have been selected as its President. He (Sir Percy) had on one occasion before the war met Mr. Whimster, and had mentally remarked that he would like him as Manager when a vacancy occurred in Bath. Very luckily, some time afterwards Mr. Whimster applied for the position; and they had never regretted their choice of him as Engineer and Manager. The present transition stage was full of problems for them all; but they would continue as successful as heretofore they had been. In conclusion, he submitted the toast, and coupled with it the name of Mr. Whimster.

The PRESIDENT, responding, said that in his case he trusted they would consider brevity the soul of sincerity, not of wit. He thanked Sir Percy sincerely for his very kind personal remarks, and on behalf of the Association for the hospitality they were enjoying. His Board of Directors always gave encouragement and support to their work. He thanked the Mayor of Bath for coming to support them, and to accord them something of a civic welcome. Lastly, he thanked the members of the Association for the splendid attendance, which he could not but feel to an extent flattering to himself. Letters and telegrams of regret at non-attendance had been received from several members, and from Mr. Thomas Goulden (the President of the Institution of Gas Engineers) and Mr. D. Milne Watson (the President of the National Gas Council). One who should have been with them was Mr. John Terrace (Chief Engineer of the South Suburban Gas Company); but unfortunately he had suffered the sudden loss of his wife. [A proposition that the Secretary be instructed to forward to Mr. Terrace a letter of condolence was carried in silence.] Mr. Whimster then recalled that it was the second visit of the Association to Bath, while four or five visits had been made by various Gas Associations from time to time. Time was short for their long programme, and the present proceedings had to be curtailed. He closed with renewed thanks to them all.

Mr. W. DOIG GIBB then gave "The Bath Gas Light and Coke Company." The happy country has no history, he said; and with it he would compare the Company, for since its formation it had prospered. Throughout it had been noted for its excellent and cheap service of gas. It had been a pleasure to hear the Mayor's praise; and he (Mr. Doig Gibb) could endorse the statement that no town was better served with gas—2s. 10d. per 1000 c.ft. was a remarkable figure in these days. To have come as successfully through the troublous times of the last few years spoke of great care, thought, and efficiency. The inhabitants of Bath, he felt sure, would benefit yet more in future. With the toast he coupled Directors, officials, and all who took part in the supply of gas to the city.

Sir PERCY STOTHERT replied briefly on behalf of the Company. Having thanked them all for their kind remarks and wishes, he mentioned that it seemed they would have to take an early opportunity of changing their name to "The Bath Gas Therm and Coke Company." He hoped it would not be the last visit of the Southern Association to Bath.

VISIT TO THE CHEDDAR GORGE AND WELLS.

The members then adjourned and soon stowed themselves into three large motor coaches, which were to convey them to one of the wonder spots of the South-West. Leaving Bath by the Avon Valley, the route lay twenty-five miles through the beautiful rolling green of Somerset and up more devious roads to the crest of the Mendips. The excursion was favoured with perfect weather. It is idle to attempt to describe the beauties of the view to those who were not present. Suffice it to say that the Cheddar Gorge is majestic, and seems to suggest California rather than a corner of our usually unpretentious country. A halt was made at Cheddar, and an entertaining half-hour spent in the Caves, where stalactites and a skull did their best to upset one's con-

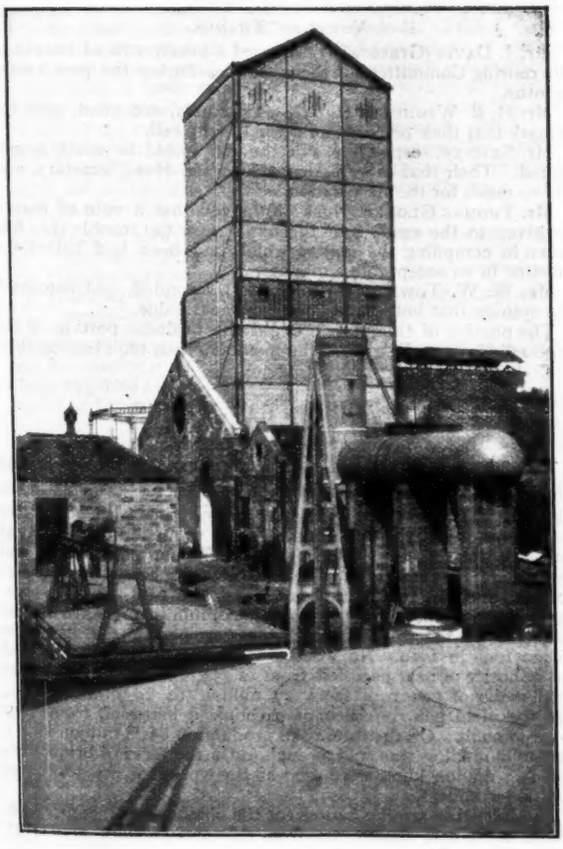
ception of Time. A photographic group was taken and tea was served in the neighbouring gardens.

The return journey took the party through Wells, where another stop was made while members examined the external and internal beauties of the Cathedral. Built in the twelfth century, the architecture still betrays the Norman school. The stone of the interior is remarkably white—the wash applied by Cromwell in so many instances having been well scoured-off within the last hundred years. The party were fortunate in hearing and seeing the famous Glastonbury clock strike six. How much would it cost to make such a clock in these less industrious days! The last stage of the run was begun at 6.20, and punctually at 7.30 the arrival back in Bath brought a very delightful meeting to a close.

GLOVER-WEST VERTICAL GAS-RETORTS AT MONTROSE.

An Up-to-Date Installation.

The Directors of the Montrose Gas Company, realizing that business men as well as companies nowadays must keep in touch with the spirit of the age, have for some time felt the necessity of adapting their resources for the production of an ever-increasing business, and last week saw the practical completion of the improvements they have projected. On Thursday the official inauguration took place of an installation of the Glover-West vertical retorts. Besides a number of shareholders (including ladies), there were present Mr. Alexander Muirden, the Chairman of the Company, Messrs. Alexander Thomson, David Smith, David W. Cargill, and David F. Craik, Directors of the Company. There were, too, Mr. Fred. J. West, Mr. Samuel Glover, Mr. Ronald Glover, and Mr. Hovey, of West's Gas Improvement Co., Ltd., Manchester (the contractors).



Glover-West Vertical Retort Installation at Montrose.

The installation, which has now been in operation for six weeks, is built across the end of the existing horizontal retort-bench. It consists of eight retorts of a capacity approaching 400,000 c.ft. of gas a day; the retorts being arranged in units of two, so that a quarter of this capacity can be brought into operation as required. There are two producers to the eight retorts. The installation is designed with a view to extension by the addition of four further retorts, giving an increase of 50 p.ct. in capacity.

The foundation is in reinforced concrete, owing to the nature of the ground. Particular care had to be exercised in the design and execution of this portion of the work, in order to avoid disturbance of the existing chimney and retort-house walls. For this reason, too, the coal-breaker was arranged above the ground level—the coal being fed to it by an inclined band-conveyor.

The retort-house building was altered to suit the vertical retorts by the addition of a superstructure of steel (with brick-filling) to the existing building. The coal is discharged from ordinary railway wagons into the receiving hopper of the band conveyor. From the breaker the coal is raised by a fixed bucket elevator to a coal-bunker above the retort-bench, containing sufficient coal for 48 hours' supply to the retorts. The coal-handling plant is driven from a steam-engine through belt, chain, and other gearing; and the coke extractors of the retort-bench are driven by gas-engines, provided in duplicate and housed within the retort-house.

The details of the Glover-West continuous system of vertical retorts are now sufficiently well-known to render any particular description unnecessary. In the Montrose installation, however, effect has been given to the developments suggested by the tests carried out at Uddingston by the Gas Investigation Committee of the Institution of Gas Engineers. In practice, absolutely even heating of the retorts is obtained; and the residual heat of the coke is made use of not only for the pre-heating of the secondary air, but for the superheating of the steam supplied to the retorts. In this way a very great increase of gas is obtained per ton of coal carbonized, without affecting either the weight of the coal dealt with per retort or the fuel consumption in the producers. At the same time the other advantages of the system are maintained; a very important feature of the design being that the temperature at any point in the length of the retorts can be regulated without affecting the heat at any other point. By this means, coals which differ greatly in physical and chemical characteristics can be efficiently carbonized. The average temperature of the retort can be increased without increasing the maximum temperature; and thus the full requirements of carbonizing, with that of the simultaneous generation of water-gas, can be met without exposing the walls of the retorts or the lining of the combustion chambers to a dangerous temperature.

Another point is that the fuel gas, secondary air, and products of combustion travel continuously forward and upwards; so that the setting can be worked with no more than sufficient draught to remove the waste gases. In this way a long flame and the slow travel of the gases in the combustion chambers are secured, which means long life for the retorts and the brickwork exposed to the combustion temperature.

The waste gases circulate round the top portion of the retorts before making their exit to the chimney. The residual heat of the waste gases is thus utilized for heating the incoming coal, with the result that heat economy is obtained and the coal gas leaves the retorts at the lowest possible temperature.

The elliptical shape of the retort secures rigidity of construction without the necessity for supports from the side walls, leaving the whole surface area of the retort for heating purposes, and ensuring absence of distortion. The retorts are built of high refractory tongued-and-grooved segments, so that leakage is prevented.

The labour required in operation is reduced to a minimum. The attendant merely has to open the coal-valves at the top of the stack every three hours, allowing the coal to flow to the coal-feed hoppers, which are in direct communication with the retorts. At the bottom of the retorts he every two hours discharges the coke by opening the doors under the receiving chambers, which have been filled automatically by the extracting machinery.

The coke falls into the barrow by its own weight; and there is no water-seal or other complication to be attended to. The producer requires inspection and cleaning every four hours. Being of the step-grate type, without doors or primary-air slides, inspection is a very simple matter. The adjustment of the setting is facilitated by the provision of dampers to the individual combustion chambers. These, however, only need attention when adjusting the setting to varying classes of coal. The usual adjustment, however, is entirely effected by regulating the chimney dampers of the several units.

After a tour of inspection of the new plant, the company took refreshment at the works. Ex-Provost Thomson proposed the toast of "The Contractors," and in doing so expressed satisfaction with the work done, and his hope that the new installation would be good both for the shareholders and their customers. Mr. Hovey replied. Mr. Alexander Yuill, of Dundee, submitted the toast of "The Montrose Gas Company," to which Mr. David Smith, Town Chamberlain, responded.

There was a presentation to Mr. Muirden of a silver salver, from the Contractors, as a memento of the completion of the installation. The presentation was made by Mr. West, and acknowledged by Mr. Muirden.

House-Heating Coke Tests.—A report has been issued of tests carried out on behalf of the United States Bureau of Mines by Messrs. James Neil and John Blizard, to determine whether coke breeze mixed with bituminous coal in combination would or would not be a good fuel for house-heating furnaces. A summary of the report states that the steaming value of a mixture of equal portions of bituminous coal and coke breeze was from 70 to 80 p.ct. of that of anthracite coal. The calorific value of the breeze was 9700 B.Th.U., and of the bituminous coal 13,800 B.Th.U.; that of the mixture being about the same as of the anthracite coal—11,500 B.Th.U. Thermal efficiencies were determined as follows: Mixed coal and breeze, 57 to 64 p.ct.; anthracite coal, 74 to 77 p.ct.; bituminous coal, 64 p.ct.; coke, 74 to 79 p.ct.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

General Business at the Half-Yearly Meeting.

THE Half-Yearly Meeting of the Association was held last Wednesday, at the Liverpool Street Hotel, E.C.; two papers being read and discussed. At the commencement of the proceedings, Mr. A. W. SUMNER, of Grays (the retiring President), occupied the chair; but he soon gave place to Mr. H. G. RUGGLES, of Leighton Buzzard (the new President).

The first item of business was the confirmation of the minutes of the last meeting.

A RESIGNATION.

The HON. SECRETARY (Mr. W. H. Mainwaring), having made reference to some communications he had received regretting inability to be present at the meeting, went on to say that he had been sorry to receive a letter from Mr. W. Beale, who was formerly Auditor, and for many years had been one of their members. He regretted that owing to advancing years he had been obliged to resign his membership of the Association. All present would share his (the speaker's) sorrow at this intimation.

THE VOLUME OF ASSOCIATION TRANSACTIONS.

The HON. SECRETARY went on to say that he had been in correspondence with the Southern Association, in reference to the resumption of publication of the volume of transactions of the District Associations; and he would be glad to have the names of those who would be willing to subscribe for the volume, in the event of some arrangement being come to. The President and himself had been deputed to attend a special meeting, to be held at the time of the forthcoming meeting of the Institution of Gas Engineers, to endeavour if possible to re-establish this publication; and it would help matters if they could get to know how many members would be willing to subscribe.

Mr. SUMNER said there might be a little difficulty with regard to those who were members of more than one Association; but he had no doubt the Secretary would take every care to prevent duplication of orders from this cause.

VOTES OF SYMPATHY.

Mr. SUMNER remarked that they had noticed with profound regret that an old member of the Association, Mr. T. S. Lacey, had passed away. He had long been connected with them, and for many years had been of great value to the gas industry. News of the death of Mrs. John Terrace had also just come to him as a shock; and in this, and in the former case, those present would like to show their sympathy with the relatives.

This the members did by twice rising silently in their places.

THE NEW PRESIDENT.

Mr. SUMNER said he now came to the most important part of the business of the day—at any rate, to two persons. He referred to the induction of Mr. H. G. Ruggles, the new President for the year 1921-22. It was really not necessary for him to say anything about Mr. Ruggles, as the members had known him for many years. He had great pleasure in asking him to take the chair; and in doing so, he wished him as happy a year of office as he himself had just enjoyed. One came into a position like this with all sorts of feelings; but really the time seemed to slip by so quickly that one had hardly got used to it when the moment arrived to relinquish it. He hoped Mr. Ruggles would receive the hearty support of the members of the Association which he was glad to say it had been his own lot to enjoy.

Mr. H. G. RUGGLES (Leighton Buzzard), who was warmly received on taking the chair, thanked Mr. Sumner for his kind words. It was, he said, becoming increasingly difficult to carry out the duties of President of such an Association as this, owing to the excellent men who had preceded one. He would, however, do his best—relying upon the continued support of the members.

THE PAST-PRESIDENT'S MEDAL.

The PRESIDENT said his first pleasant duty was to present to the retiring President the Past-President's Medal, as a slight mark of appreciation of the work he had done for the Association and of regard for him personally. He trusted Mr. Sumner would be spared to retain the medal for many years to come, and that it would always remind him of a happy time as President of the Association. He asked them to tender to Mr. Sumner very hearty thanks for his services to the Association in the office which he had so worthily filled. [Applause.]

Mr. SUMNER, in returning thanks, said he had often wondered who had originated the practice of presenting a medal to the Past-President; but he had never been able to find out. However, it seemed to him a very good idea indeed. It was nice to have a memento of the work one had done. This was the only gold medal he had ever had, or expected to have, so that they might rest assured he would appreciate it very much.

NEUTRAL SULPHATE MANUFACTURE AT BEDFORD.

Mr. J. B. HANSFORD then read a paper on the "Manufacture of Neutral Sulphate of Ammonia at the Bedford Gas-Works;" and this, with a report of the discussion, is reproduced on p. 721.

ASCENSION PIPE DEVELOPMENTS.

Mr. W. H. WARREN, of Beckton, followed with a paper on "Ascension Pipe Developments"—for which, and the discussion upon it, see p. 723.

REPRESENTATIVE ON THE INSTITUTION COUNCIL.

Mr. SUMNER proposed that the President be elected the representative of the Association on the Council of the Institution of Gas Engineers.

Mr. T. A. GUYATT (Ely) seconded, and it was agreed.

PLACE OF NEXT MEETING.

The PRESIDENT said they now had to consider the place of next meeting. He had put this matter before his Directors; and they had asked him to convey to the members a very cordial invitation to hold the spring meeting at Leighton Buzzard. His Board had very happy recollections of the last occasion on which a meeting of the Association took place there, though it was some fourteen years ago; and they would be pleased to do all they could for the comfort and convenience of the members if they would go there again.

Mr. P. D. WALMSLEY (Great Yarmouth) proposed that the invitation to hold the next meeting at Leighton Buzzard be accepted. It had been his pleasure on a previous occasion to visit the President's works, and also to have some dealings with his very amiable Chairman and Directors; and he was quite sure that Mr. Richmond and his colleagues would give the members a very hearty welcome.

Mr. J. H. TROUGHTON (Newmarket) seconded, and recalled pleasant recollections of more than one visit to Leighton Buzzard.

The resolution was unanimously passed.

VOTES OF THANKS.

Mr. J. DAVIS (Gravesend) proposed a hearty vote of thanks to the retiring Committee for their services during the past twelve months.

Mr. H. R. WIMHURST (Bury St. Edmunds) seconded, with the remark that their officers had served them well.

Mr. SUMNER, responding, said the vote would be much appreciated. Their thanks were also due to the Hon. Secretary, who did so much for the Association.

Mr. THOMAS GLOVER (Norwich) moved that a vote of thanks be given to the readers of the papers, for the trouble they had taken in compiling the matter which had been laid before the meeting in so acceptable a manner.

Mr. W. W. TOWNSEND (Colchester) seconded, and expressed the opinion that both papers were of great value.

The passing of this vote brought the business portion of the proceedings to a close; and the members then took tea together.

THE ZÜRICH GAS-WORKS.

The Zürich Gas-Works is one of those municipal undertakings which publish a closely analyzed report of each year's operations. That for the year 1920, which has recently been issued, further traces the changes which resulted from war conditions; and at the same time, it shows the progress being made towards normal methods of manufacture. The fall in the quantity of coal carbonized, and the rise in those of wood and peat, which respectively reached their minimum and maximum in 1919, are special features. In 1920, 70,028 tons of coal were carbonized, as against 56,000 tons in 1919. No wood was treated in the retorts, and the quantity of peat used fell from 12,753 tons to 850 tons. The total make of gas rose from 27 million to 29 million cb.m., and the yield per 100 kilos. of carbonized material, from 31·57 to 40·46 cb.m. Of the total coke production (51·8 million kilos.), 34·7 million kilos. was sold as such (or in the form of briquettes), and 15·3 million kilos. were used on the works for firing furnaces and under boilers.

The following are the figures for the chief other bye-products. Those in the first section are from the total production of 4·357 million kilos. of tar.

	Production. Kilos.		Sale. Kilos.
Crude benzole	141,802	..	139,801
Light oils	271,577	..	271,183
Mixed heavy and light oils	863,707	..	825,479
Anthracene oil, crude	162,636	..	116,975
Tar, distilled and treated	1,528,495	..	1,397,287
Pitch, soft, medium, and hard	1,134,188	..	1,049,428
Retort pitch	202,275	..	228,275
Ammoniacal liquor	331,265	..	315,265
Sulphate of ammonia	514,908	..	374,908
Retort graphite	17,905	..	18,905
Spent oxide	815,140	..	715,140

In consequence of the high level of the price of coal and of working expenses, the cost price of the gas during 1919 exceeded the sale price. A considerable advance in price in 1920 became necessary; and from March, 1920, the price had been raised from 40 to 55 rappe (centimes) per cb.m.

THE MANUFACTURE OF NEUTRAL SULPHATE OF AMMONIA AT THE BEDFORD GAS-WORKS.

By J. B. HANSFORD, Engineer and Manager.

[A Paper read before the Eastern Counties Gas Managers' Association, Sept. 21.]

In view of its interest to the industry at the present moment, I have been asked by the Secretary to give you a description of the plant and process for the production of neutral sulphate of ammonia, which has been working at the Bedford Gas-Works for the past eight months.

Firstly, I would explain what led me to make the apparatus I am about to describe. Bedford and district, as most of you are aware, is partly an agricultural and market gardening centre; and, naturally, there is a large demand for some form of nitrogenous fertilizer. Nevertheless, my Company before the war, and up to the year 1916 (when sulphate was controlled by the Board of Agriculture), sent out of the district nearly the whole of its output of sulphate of ammonia—viz., from 90 to 95 p.ct. This figure of less than 10 p.ct. of the sulphate of ammonia produced, I believe, was the average amount consumed at home up to 1914. The reason was largely, if not entirely, owing to the unsatisfactory physical condition in which sulphate is sold by gas-works. The user has to prepare the salt before it can be sown; and then it is not possible to use a horse-drawn drill, but it has to be applied by hand. I have been told many times (in none too polite language) by farmers and users, how sulphate has to be treated by them before it can be applied to the land—viz., spread upon a barn floor, rolled, and crushed; entailing considerable labour, loss, and expense, especially with the tools a user has at disposal.

Sulphate of ammonia has been credited by users with souring the land by continual use, necessitating the employment of lime or some alkali to the soil after certain periods. This I think is due to the salt containing a considerable percentage of free acid, and also to being sown by hand. Salt (containing, say, 0·70 p.ct. of free acid) is fairly solid in form, and very difficult to spread. Consequently patches of land receive too big a dressing, and at the same time an undue quantity of sulphuric acid. With a view of obtaining an article in a better physical condition, and free from these imperfections, I very carefully examined existing processes for neutralizing the acid salt after manufacture. These might be classified under three headings:

1. Washing away with water the acid film of mother liquor surrounding the sulphate crystal.
2. Gassing with ammonia.
3. Washing or spraying with an alkaline liquid, and thereby neutralizing the free acid.

I came to the conclusion that the important points of any process for making a neutral salt were: Initial cost; technical supervision required; labour entailed; loss of ammonia; mother liquor made; and results that can be guaranteed. After carrying out a number of experiments, bearing these points in mind, I commenced work along the lines of our present process, making the whole of the necessary apparatus on the works.

The Bedford process differs in the main from other methods, in that the saturator bath is worked-down to neutrality before the charge is removed—thus making the actual neutral product; the two obstacles, loss of ammonia and discoloration, being overcome by providing the necessary apparatus to enable the still gases to be shut-off from the saturator bath when the neutral point is reached.

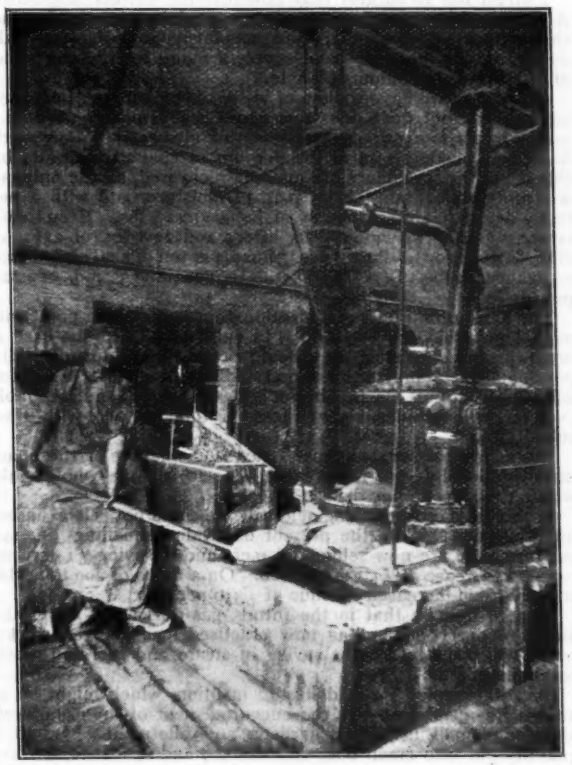
The plant consists of a small secondary saturator fixed above and adjacent to the existing fishing or primary saturator. It is fitted with two cracker pipes, one connected to the ammonia still gas-pipe, and the other connected to the waste-gas pipe from the primary saturator, with a waste-gas outlet connection. Valves are fitted on both the ammonia gas inlet pipes and between the waste-gas pipes. On the secondary saturator a run-off pipe into the primary saturator is fixed just above the level of the cracker pipes—insuring always a small seal. Both saturators are fitted with acid and water feeds, and also with steam circulators. The circulation or agitation in the primary saturators is of great importance.

The method of operation is very simple. It is as follows: The primary saturator is made up to 60° Tw., and is allowed to run down to about 57° Tw., when the valve on the waste-gas pipe is shut, thereby sending the gases through the secondary saturator. Just before reaching 52° Tw. the steam circulator or agitator is turned-on, whereby the whole contents are thoroughly mixed; and upon reaching 51° Tw., which is about neutral point, the bath is tested by a small sample of the liquid in a test-tube diluted with water, and a little methyl orange added, which, if neutral, gives a yellow colour. The still gases are then shut-off, and turned into the secondary saturator; and the neutral salt is then fished on to the draining table. When the batch has been got out, the contents of the secondary saturator are run into the primary saturator, and the still gases are also turned into the primary saturator. Both saturators are then made up to about 60° Tw., and the procedure goes on as before.

The drying apparatus consists of a steel circular table, heated by means of six gas-burners placed underneath, and driven by a small engine, which revolves at the rate of about 25 R.P.M. The edge of the table is 8 in. high; and 4 in. up is a 2 in. space over which is fixed a wire gauze of ten meshes to the inch. Suspended from the framework are four ploughs or rakes which rest on the table. Opposite these ploughs is a small cast-iron roller or crusher, also suspended from the framework, which can be easily lifted clear of the table. Surrounding the table is fitted a small circular hopper, with an outlet under which the bags are fixed to receive the sulphate when dried.

The salt is thrown on the table; and as the table revolves, at each revolution the ploughs turn the salt over, and by revolving or passing through the air very quickly the moisture is liberated, and the salt is quickly dried. The ploughs are then lifted clear of the table, and the salt is allowed to pass through the circular wire gauze by centrifugal action, and thence from the hopper direct to bags. A small proportion of the salt will remain in small undried lumps, which are then put under the roller for a few revolutions, when they also quickly dry and become powdered. The roller is then lifted clear, and the crushed dried salt passes through the sieve and into the hopper and bags.

When the salt has remained on the draining table about half-an-hour, the moisture content is about 8·5 p.ct. It has a dark greyish colour, and coheres in masses similar to the shape of the scoop; and, if allowed to remain on the board for several hours, its physical condition varies very little, with no hard caking as in the case with an acid salt. The retained moisture is about



The Sulphate House at the Bedford Gas-Works.

6 p.ct., which is a higher figure than that experienced with acid salt, which appears to drain much quicker—caking hard at the same time.

Our practice is to commence drying the salt after it has remained on the draining table half-an-hour. A batch sufficient to fill a 2 cwt. bag, when dried and crushed, requires about half-an-hour—the gas consumed being 95 c.ft. This works out at 950 c.ft. per ton of dried salt, with a moisture content of 0·15 p.ct. with gas at 4s. per 1000 c.ft. (manufacturing cost). Therefore the drying costs 3s. 9d. per ton of dried salt. [This, added the author, was not strictly true; for though six burners are used to start with, when the table has become heated three can often be put out.] The machine can deal with 5 tons per day.

The analysis of the salt is very regular, and constantly yields the following figures—the samples for analysis being obtained by the following method. As each batch is dried, a small long narrow scoop-full is taken, and put into a box. Every morning this is tested for neutrality and moisture; and a sample of the salt is put into a bottle, and at the end of the week a complete analysis is made. The figures have been found not to vary more than 0·05 p.ct. I give an average analysis:

	P.Ct.		P.Ct.
Ammonia	25·7	..	99·89 $(NH_4)_2SO_4$
Nitrogen	21·16	..	—
Moisture	0·14 to 0·18	..	0·15
Free acid	*Nil*	..	—
Insoluble	trace	..	trace
			100·04

The factor for converting the percentage of NH_3 into the percentage of $(NH_4)_2SO_4$ is taken as 3·887.

The chief advantages of the process are:

1. The comparatively small capital outlay.
2. No additional working expenses, beyond the running of the drying machine (excepting in plants of 2 tons and over, when the drying and handling of the salt made would require additional labour).
3. The production of an article which will meet the market needs, and one of increased value.
4. Little or no technical supervision; the working being easily carried out by the average sulphate plant.
5. Neutrality is guaranteed simply by ascertaining that the neutrality test is properly carried out.
6. The constant manufacture of an even-testing quality of sulphate.
7. Mother liquor is entirely eliminated.
8. In large plants it would probably not be necessary to use the washing plant for the recovery of ammonia from the devil liquor and waste gases.

My experience is that good sulphate, in a perfect physical condition, should be over-neutral or slightly alkaline, as in this condition caking and absorption of moisture will not take place so readily, when stored for any length of time. The colour will be slightly darker than usual—a light brownish grey.

I would like to suggest that now that the British Sulphate of Ammonia Federation have standardized sulphate into grades, they should also publish standardized tests for its analysis—especially as regards the moisture—and supply a figure for the conversion of N_4H_8 into ammonium sulphate.

In the past we have spoken of yields of sulphate per ton of coal carbonized; but what does this figure really mean? Would it not be better to express it as pounds of nitrogen? Many works have been making (say) 24 lbs. per ton of coal carbonized; but this is not the true figure of ammonia recovered, as the sulphate will probably contain (say) 5 p.ct. of moisture, and with a perfectly dry article we shall only make (say) 22·8 lbs. Even then it is the "£ *s. d.*" we should look after; and 22·8 lbs. of 25½ p.ct. NH_3 is worth on to-day's prices 34·92d. per ton of coal carbonized, as against 24 lbs. of (say) 24¼ p.ct. NH_3, equalling 32·70d., or 2·22d. per ton less.

The present market value of sulphate is a very sore point with us all; but what are we to do with our liquor? In the case of my own works, we must turn the liquor into some form for disposal, and the manufacture of our sulphate in a better condition will surely enable us to obtain better markets, and probably even larger local sales, and at the same time compete with other substitutes.

In the first part of this paper I gave some figures of the quantities sold locally; but this year I hope to sell the whole make within the surrounding district.

In the old days of making acid salt, we could not sell a higher quality than 24¼ p.ct., the present day value equalling £12 14s. per ton. We are now selling 25½ p.ct., and receiving £14 7s. per ton—an increase of £1 13s. per ton. On a make of 200 tons this is equal to an increased revenue of £330 per year.

I am of opinion that in the future, gas-works will adopt the direct recovery method as now practised in coke-oven works, which will result in a great saving of steam and fuel and costly scrubbing plant.

One other point I would like to mention, which might be of interest to members—viz., the encouragement of the use of sulphate by small users for gardens and allotments. I had a quantity put into small bags containing 7 and 14 lbs., which are on sale in our showrooms and offices; and during August the sales reached nearly a hundred bags. You may consider this is no great quantity, but at 1s. 6d. per bag of 7 lbs. the sulphate realizes £24 per ton. I believe that it is in this direction that we must all of us work, if we are to compete successfully with other sources of nitrogen.

DISCUSSION.

Mr. HANSFORD, after reading his paper, handed round some samples of the sulphate in 7-lb. bags, and also a sample which had been left three-quarters-of-an-hour in the saturator after it had become neutral—the only effect, he pointed out, having been to make it a little brown.

The PRESIDENT (Mr. H. G. Ruggles, of Leighton Buzzard) said they were much indebted to Mr. Hansford for the preparation of his instructive paper on a subject which was not only of great interest to manufacturers of sulphate, but also to those engaged in the agricultural industry.

The HON. SECRETARY (Mr. W. H. Mainwaring, of Lincoln) said he had invited Mr. Speyer, of the British Sulphate of Ammonia Federation, to be present, and had asked him to send an expert if he himself was unable to attend. Unfortunately, however, he was not able to do either. The idea that had been in his mind was that as Mr. Speyer's Association had officially inspected the plant, he might be in a position to give them some further information. He had asked Mr. Hansford to prepare the paper very much from a personal point of view, because he was to a large extent in the same position as the author—that the present sulphate was not fit to sell to any farmer. There was too much labour required in breaking it up before it could be used in drills. He wished to find out the most economical process of manufacturing sulphate. There were four or five of the processes on the market; and it was only by ascertaining the cost and relative advantages of them that a selection could be made. If they intended to maintain their market for sulphate and get a decent price, they would have to make sulphate which was fit to use, something on these lines.

Mr. THOMAS GLOVER (Norwich) said the paper was a very useful one; and the author was to be congratulated upon his inventive powers and ingenuity in arranging the plant on somewhat novel lines. With regard to the neutralization, it seemed to him quite a natural way to do it. This was, to have a second saturator or catch vessel, while the primary saturator was being discharged of its salt; the contents of the second saturator being run into the primary one afterwards. This seemed a very sensible and workmanlike method of dealing with the matter. He would like to ask what quality of cocks or valves the author used on these vessels, because in dealing with corrosive vapours it was very important to have valves that would remain moderately tight, and would not require replacing at too early a date. He took it that, with the table which was used for drying the salt, which was heated with gas-burners underneath, the drying process depended entirely upon the temperature of the table. There was evidently a little risk of the table, if not watched, getting too hot. He would have liked to see a diagram of this, though he thought he could follow the arrangement clearly from the description just given. The ploughs, he took it, were to throw the salt into the middle of the table, and to keep turning the salt over, so that the surfaces which were next the table at one time were turned uppermost, and those on the top turned downwards. The ploughs were removed when it was time to throw the salt through the gauze edge 4 in. above the table. He took it the 25 revolutions per minute were sufficient to throw the salt from the surface of the table through the sieve into the circular hopper outside the table, which gathered the salt for bagging. Was this correct?

Mr. HANSFORD: No; we speed-up to 30 to 35 R.P.M., and it will go through quite easily. We throw it off in that way.

Mr. GLOVER: During drying it is 25 R.P.M., and when you throw the salt off you increase the speed?

Mr. HANSFORD: When you remove the ploughs and the roller, it naturally speeds the thing up.

Mr. GLOVER: And the salt being in the nature of sand is easily thrown-off by centrifugal action. Continuing, he said the only drawback he could see to this method of drying was that it simply depended on the surface of the table, and not on hot air. If one had the salt travelling through a tube, with a counter-current of warm air passing, there would not be this dependence on a hot surface. But possibly such an arrangement would have involved more apparatus; and it was not always desirable to have the most efficient apparatus for a simple operation. The plan they had heard described did the trick, and did it, he assumed, very well. He did not know whether they ought to say very much about the cost of gas; but 3s. 9d. per ton for gas for drying struck one as being just a little expensive. Could it not be done with a steam-heated table or the hot-air from a coke-fire? The gas-flame was, of course, a very simple way; and the cost was more than compensated for, he took it, by the greatly increased value of the salt.

Mr. HANSFORD: There is no labour.

Mr. GLOVER: I do not know whether the cost of 3s. 9d. includes the cost of driving the gas-engine?

Mr. HANSFORD: It is a steam-engine.

Mr. GLOVER said that, with regard to sulphate generally, he quite supported Mr. Hansford in feeling that they must improve the quality of the salt, if sulphate making was to survive. Those who were making neutral sulphate of the quality shown by the author would have a much better chance than those making salt containing excessive acid, which rotted bags, and was lumpy. Some of the old sulphate had all the qualities which were undesirable for the farmer. They must make their sulphate of a quality fit for selling to local farmers; and they were likely to continue making it longer if they could get a price which would pay for the process of manufacture. In some way or other, they should devise means to bring down the cost of acid. ["Hear, hear."] The cost of labour and fuel did not count very much in many works, because the plant was driven from the common source of steam on the works; but where the process was carried on as a separate chemical manufacture, and particularly if the liquor had to be carried any distance, the value of ammoniacal liquor was now *nil*. It was an uncommercial proposition to work-up ammoniacal liquor under such conditions.

Dr. R. LESSING (London), being called upon, said that if he could add anything to the discussion he would be glad to do so, because he thought they were all agreed that everything possible must be done to encourage the preparation of a neutral sulphate in place of the old lumpy acid one. He need hardly go into the reasons for this, as they had already been set-out on various occasions; but during the last three or four years, since neutralizing sulphate had become a practical proposition, the position had changed to the extent that, while it was then necessary—and even one or two years ago it was still necessary—to try and convince people by the aid of figures that so much more money could be obtained for neutral salt than for acid salt, and therefore there was a greater profit from the former, he fancied to-day no such need existed. As a matter of fact, he thought that in another five, or perhaps less number of years, it would simply not be possible to sell acid sulphate in the world's market. It might be practicable, just in the farming districts surrounding one particular works; but even then if there was a supply of neutral sulphate, it would have the pull over the other. To think that a market would remain for an article which corroded bags and formed in lumps that could not be used in the ordinary farmer's drill was out of the question. So much for the general proposition that all sulphate ought to be neutralized. There were, of course, a number of processes for carrying this out; and Mr. Hansford had mentioned three ways of doing it. There was, however, another method of carrying out the operation, in which he (Dr. Lessing) was rather keenly interested personally, and which the author did not mention. This was the admixture of neutralizing agents in solid form, and not in solution. As to the cyanogen compounds in the gas, they had been told during the last few years that it was not permissible to run a saturator to the neutral point, because in this condition the cyanogen compounds were thrown down as insoluble compounds, and would not be removable again from the mother liquor.

If in the first saturator the salt was brought to neutral point, he would like to ask whether the author had any difficulty. Mr. Hansford mentioned that there was practically no mother liquor to work-up, so he took it that the difficulty must have been overcome. Another question he would like to ask was with reference to pyridine. This was a most important item with reference to neutralizing salt. There were some who said that pyridine was entirely responsible for acidity. He would not like to say whether this was right or wrong; but personally he did not think it was entirely due to the pyridine. There was, however, no doubt that, unless the pyridine was completely neutralized, and kept in the neutralized condition, it was better to remove it, and have then to deal with ammonia only. This was why he proposed three years ago to make a salt free from pyridine, and free from moisture. He believed he was the first to do so. In regard to drying, he thought it was very ingenious to have a table such as had been described; but, there again, in his experience, he found that drying through a metal surface rather tended to promote the formation of crusts. He did not know whether the ploughs in this particular machine were so constructed as to keep the salt away from the surface, and sufficiently on the move to prevent the formation of crusts. These crusts formed by high heat were rather different from the lumps formed in the sulphate store. They were very much harder—in fact, they were rock-like. Perhaps Mr. Hansford would be good enough to tell them something about this, because such crust formation would not be possible if, as Mr. Glover had suggested, hot air was used instead of heat transmitted from a metal surface. For two or three tons a day or more, he ventured to suggest that the application of hot air would be absolutely essential.

Mr. A. E. BROADBERRY (Tottenham) said their friend Dr. Lessing had become a prophet, as well as being an eminent chemist. He said that in two or three years' time they would have the British farmer insisting upon neutral sulphate. No doubt the British farmer would be well-advised if he fulfilled this prophecy; but from the experience they had had at Tottenham, he felt a little doubtful upon the point. There they had a system for producing neutral salt; and for this they had attempted to get an extra 5s. per ton from the British farmer. The farmer, however, who knew all about the Federation price lists, said: "I am not going to pay the extra 5s. per ton; I would rather have acid salt." This was the position. He might say they had no drying arrangement. When he heard of Mr. Hansford's development at Bedford, he went over there to see the plant in operation; and he could testify to the neatness and sweetness with which the work was carried on. A most excellent salt was produced without any trouble at all. Of course, the secondary saturator was somewhat superimposed on the first one. This was easy to do in a comparatively small works; but in the case of his own plant, it would have been a rather difficult job to lift-up one of the saturators to a level above the other one, so as to run the liquor back from the secondary to the primary one. They had not done anything in this way up to now; but to test-out the effect of the process, they made temporary connections so that they were able to work one of the saturators as a primary and the other as a secondary one. In this way, he was pleased to say they were able to produce a salt which was quite neutral; and although they did not rig-up any drying apparatus, they dried a portion of it artificially in the laboratory, and produced a salt which under analysis was practically identical with the analysis which Mr. Hansford had given in his paper. If he were putting-up another sulphate plant, he thought he should undoubtedly take advantage of the work Mr. Hansford had done, and the excellent information he had put before them.

The PRESIDENT said the remarks of the various speakers had been very interesting. It seemed to him to be absolutely necessary for sulphate to be acid-free, on account, particularly, of the increasing amount of competition they were now receiving from other countries in this respect. Looking through the Technical Press a few days ago, he saw that, whereas in 1912 the amount of synthetic sulphate manufactured in Germany was *nil*, in 1920 1½ million tons of synthetic ammonia was produced—which, of course, would be both acid and moisture free. On a comparatively small works like his own, it might be difficult to get men to take sufficient interest to carry out the tests. The author did not give any figures of cost; and it would be interesting to know whether the outlay on the additions made was excessive, because certainly the advantages which had been pointed out would be worth a great deal of trouble to put the plant in provided the capital expenditure was not excessive. With reference to drying, no doubt before the drying table was installed the author went carefully into the various methods in general use, and found advantages in the table method over the more common plan of drying by centrifugal force.

Mr. HANSFORD, in reply, said that, as regarded the operators, it was the easiest thing in the world to carry on the process. It was much easier than in the old acid days. A man, once trained, could not go wrong. The only thing he had to do was just to take the colour test at the end. Even if they went past it, one could not lose any ammonia. No doubt in bigger works it would be better to put the salt through a centrifugal machine first; but in his own case the cost made it altogether out of the question. The valve used was an ordinary Dewrance cock; but on the side he tapped a hole and put in a Stauffer lubricator to keep a film of grease round the plug. The other valve was an ordinary 6-in. Donkin valve, with a cast-iron spindle inserted. For drying, he tried many ideas before successfully adopting the one he had described. Steam, gas, coke, and all sorts of things, were experimented with. He meant eventually to put blue water gas on the plant; and the process would not cost so much then. As he mentioned when reading the paper, the figure given there was too high, because it was calculated on the use of six burners; whereas when once the table was warm, this number could be reduced to three. The temperature at which the salt should be dried was 130° C. What he was trying to do now was to keep both saturators as hot as possible, with the idea of buying a weaker acid, which they ought to be able to purchase cheaper. With reference to Mr. Broadberry's remarks, in the case of big plants it would be better to have two saturators with a bottom discharge, so that they could work one and switch the gas over to the other, and discharge alternately, so as not to handle liquids at all. The cyanides had given no trouble at all. Since making the neutral sulphate, they had never seen a trace of prussian blue. Undoubtedly, cyanides were there; but they were not high enough to test. This was a point which, he thought, had never yet been thoroughly thrashed out; but so far as colour was concerned, he had never had a blue batch at all. The cost ran to from £350 to £400 for a 20 cwt. or 30 cwt. plant. It ought to be cheaper; but lead and labour were both dear. He did some work before the war in connection with drying through the medium of air; but he found that the cost of heating the air was very much more than the stuff was worth. This was why he went on to direct heat. They certainly did get a little formation of crust; but it was not much. The ploughs removed it; and the roller hammered it away. It was not lost.

ASCENSION PIPE DEVELOPMENTS.

By W. H. WARREN, of Beckton.

[A Paper read before the Eastern Counties Gas Managers' Association, Sept. 21.]

The statement that "profits are made (or lost) in the retort-house" is axiomatic; but the part that the ascension-pipe plays in the diminution of profits is not so generally realized. In these days of high temperature carbonization, stopped pipes are the bugbear of the gas engineer. Perhaps I should say, potentially stopped pipes; for when I have inquired of others how they kept their pipes clear, they have replied darkly and with meaning: "We augur them." Some, more explicit, told me of special tools and of elaborate systems which they had for cleaning pipes. I even heard of machines for the purpose. All were agreed that they could keep their pipes free, and get the gas away from their retorts. They waived the question of cost.

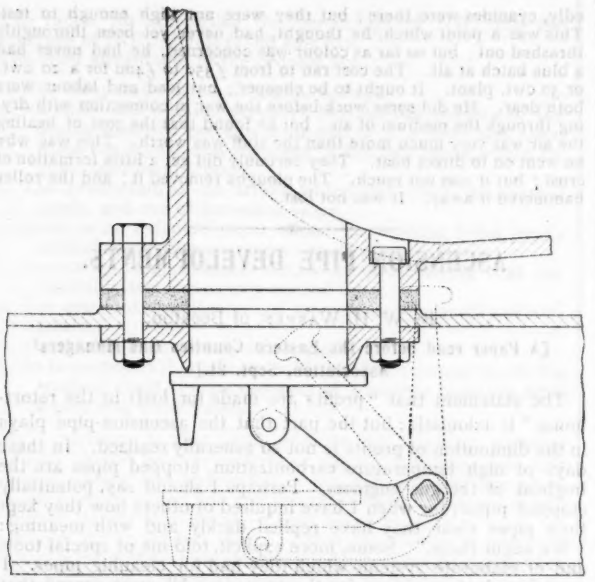
The cost of labour employed to clean pipes can be easily ascertained, and recorded. The loss of gas (owing to pipes becoming wholly or partly stopped) from the volume actually made, may with some uncertainty be estimated; the loss due to deposition of the substance which stops the pipes cannot be measured, but is by no manner of means negligible. This loss is a loss of high-quality gas, of tar, and in some degree of ammonia. What other mischief may be happening during the cracking-up of the gas and tar is a matter for further speculation. What causes a stopped pipe? There are many alleged causes, and but one prime cause—that the pipe is too hot. Other suggested causes, if genuine, are indirect; they stop the pipe because they make it too hot. Thus excessive vacuum is said to cause stopped pipes; and so it will do if lids or retorts are leaky and allow air (which burns) and furnace gases (which raise the temperature of the pipe) to be drawn in. A heavy seal, too, will cause pipe troubles, because the wash in the hydraulic main allows an excessive retort vacuum half its time. The effect of excessive retort temperature and of slack charges in aggravating pipe trouble is well known, and is obviously due to the heating-up of the pipes.

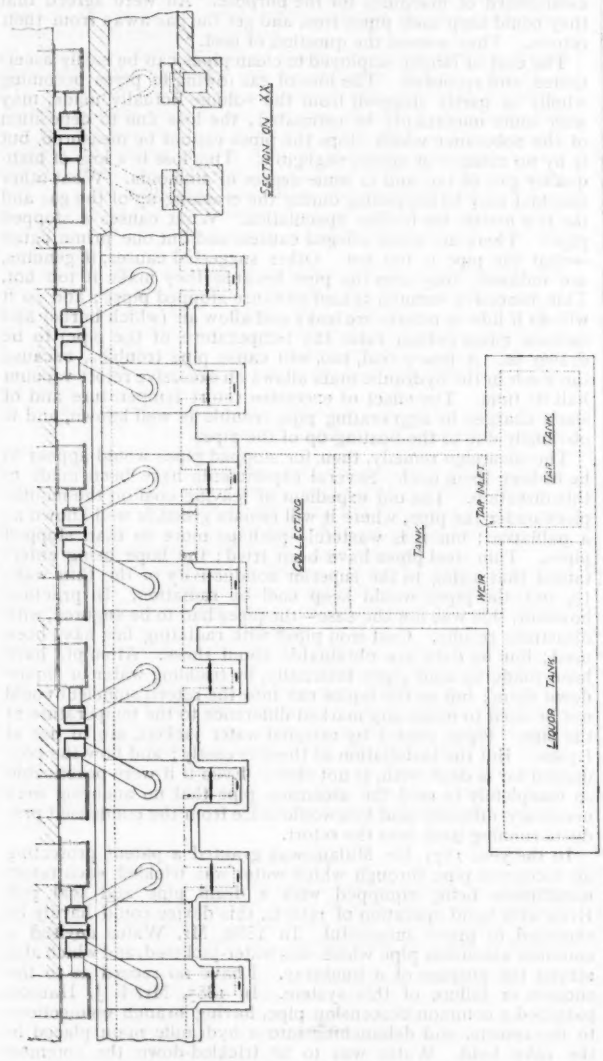
The sovereign remedy, then, for stopped pipes would appear to be to keep them cool. Several experiments have been made in this direction. The old expedient of leaving coal on the mouthpiece under the pipe, where it will remain green, is well known as a palliative; but it is wasteful—perhaps more so than stopped pipes. Thin steel pipes have been tried; the hope being entertained that owing to the superior conductivity of the thin walls ($\frac{3}{16}$ in.), the pipes would keep cool by radiation. In practice, however, this was not the case—the pipes had to be augured, with disastrous results. Cast-iron pipes with radiating fins have been used; but no data are obtainable about these. Attempts have been made to cool pipes internally, by trickling water or liquor down them; but as the liquor ran into the retort, sufficient could not be used to make any marked difference to the temperature of the pipe. Pipes, cooled by external water jackets, are in use at Lyons. But the installation of these is costly; and how the condensed tar is dealt with, is not clear. Even if it were practicable so completely to cool the ascension pipe that no auguring were necessary, difficulty and loss would arise from the condensed products running back into the retort.

In the year 1874, Mr. Malam was granted a patent protecting an ascension pipe through which water was trickled, each retort mouthpiece being equipped with a drain pipe and seal pot. Even with hand operation of retorts, this device could hardly be expected to prove successful. In 1880, Mr. Wates devised a common ascension pipe which was water-jacketed, and which also served the purpose of a buckstay. I have no record as to the success or failure of this system. In 1885, Mr. I. J. Hanson patented a common descension pipe, having branch connections to the retorts, and debouching into a hydraulic main placed in the coke hold. Water was to be trickled down the common pipe in sufficient quantities to keep it cool, and prevent it from stopping. I do not know whether this system was successful or, indeed, whether it was ever put into operation.

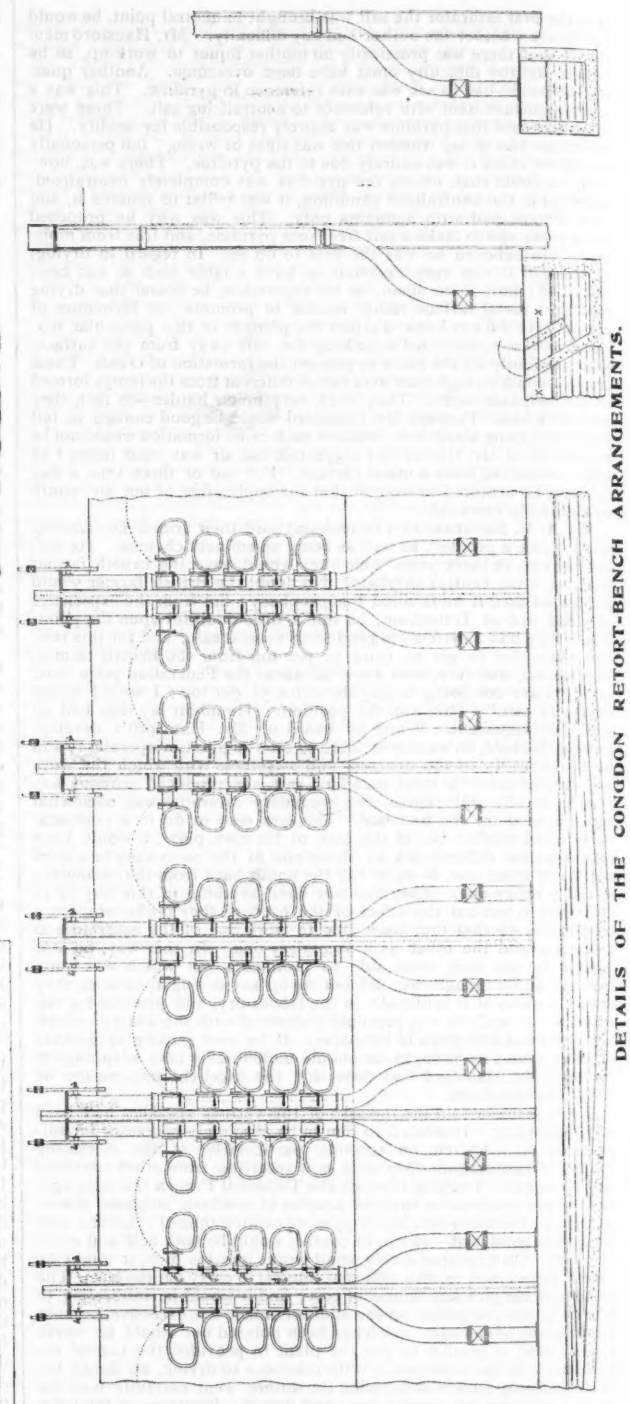
In the United States considerable thought appears to have been given to the problem of stopped ascension pipes; and Mr. R. Congdon, of Atlanta, Georgia, working upon the same lines as Mr. Hanson, in 1914 obtained a patent which covers:

> "Apparatus for the manufacture of coal gas, the combination of a retort, a stand-pipe in communication with and extending above and below the retort, a valve arranged in the stand-pipe for establishing and disestablishing communication between the stand-pipe and the retort, means for withdrawing gas from the retort upward through the stand-pipe, and means for supplying liquid downward through the stand-pipe on to the valve and past the retort."





This arrangement is well adapted to settings in which the retorts are placed in two vertical rows. Ascension pipes of rectangular section, and ample size, are led up alongside each buckstay. Each of these pipes is common to all the retorts on its own side of the setting, connection being made to each mouthpiece by means of a short cast-iron pipe. At the junction of each connecting pipe with the common ascension pipe, is a simple and reliable valve for use when charging retorts. The common ascension pipe is connected at the top to a large pipe which dips into the hydraulic main in the usual manner; and the lower end below the charging stage is sealed in a trough, in connection with which a system of tanks for separating tar from liquor is installed. Liquor is continuously pumped through jets in the top of the ascension pipes, and returns down them *vid* the seal-tank to be re-pumped.



DETAILS OF THE CONGDON RETORT-BENCH ARRANGEMENTS.

The advantages claimed by the inventor of this system are that the pipes never need cleaning, and that the cost of installation is considerably less than that of the ordinary system.

As an experiment, two settings at Beckton were equipped with Congdon pipes. These settings were each of ten, 24 in. by 18 in. by 20 ft. retorts, stoked by a Fiddes-Aldridge machine with stop-plate. The retorts were originally fitted with 7-in. ascension pipes, one to each retort, which were only kept clear by regular auguring and burning-out, and which invariably gave trouble when any increase of the heats or cessation of charging occurred. A seal of ½-in. liquor was maintained in the hydraulic main, while the vacuum kept was such as produced a gas of about 520 B.Th.U. at the outlet of the meters. The ordinary ascension pipes of these settings were replaced by stand-pipes, each having two 8-in. bridge-pipes leading to 10-in. dip-pipes. The troughs, for the purpose of sealing the stand-pipes and collecting and separating the liquor and condensed tar, were constructed of concrete in the ground below the stage.

The installation started to work in November, 1920; but it soon became evident that many details in the design (which had been faithfully copied from the American installations) were quite unsuited to the conditions obtaining at Beckton. The stand-pipes,

which are built-up of $\frac{3}{16}$-in. steel plates, are prone to leak on any change of temperature—for instance, after the Sunday rest.

After some experiments, it was found that, by shutting the valves, and maintaining the flow of liquor during the periods when charging was discontinued, it was possible to keep the stand-pipes reasonably tight. A much more satisfactory job (and cheaper) might be made by constructing the stand-pipes of cast iron. The short connections from the mouthpieces to the stand-pipes, intentionally left to their own devices, became stopped-up solid, and attempts to clear them with a chipper, resulted in lumps of pitch falling down to the bases of the stand-pipes and obstructing them. Trouble was experienced with liquor striking the valve-discs, and being projected into the mouthpieces; while the valve gear, being of decidedly flimsy construction, was given short shrift at the hands of none too sympathetic stokers.

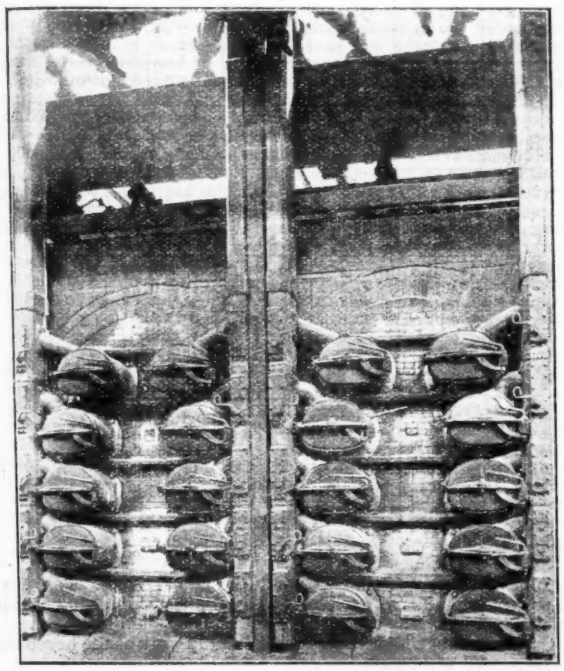
Last February the settings were let-down for inspection, and in order to remedy the above defects. The stand-pipes were found to be perfectly clean internally. The short connections were thoroughly cleaned; and it was afterwards found that by passing a door-hook through them each draw, it was possible to keep them in this condition. The construction of the valve-gear was materially strengthened; and the disposition of the discs was altered, so as to avoid the projection of liquor into the retorts. The stand-pipe seal-tank was cleaned-out—being found to contain quantities of thick tar and lumps of pitch. The bridge-pipes and dips were examined and found to be perfectly clean.

The settings were put to work again in March, and they continued to work without incident till August, when the stand-pipes were again opened for inspection. Three of them were found to be perfectly clean; but in the fourth an accumulation of pitch was found between the first and second valves. Pitch was also found in the seal-tank below each stand-pipe. These accumulations result from the previously mentioned necessity for passing a tool up the short bends at each charging. The short cast-iron bends are one of the weak points of the Beckton installation. They should be eliminated by bolting the stand-pipe direct to the mouthpieces.

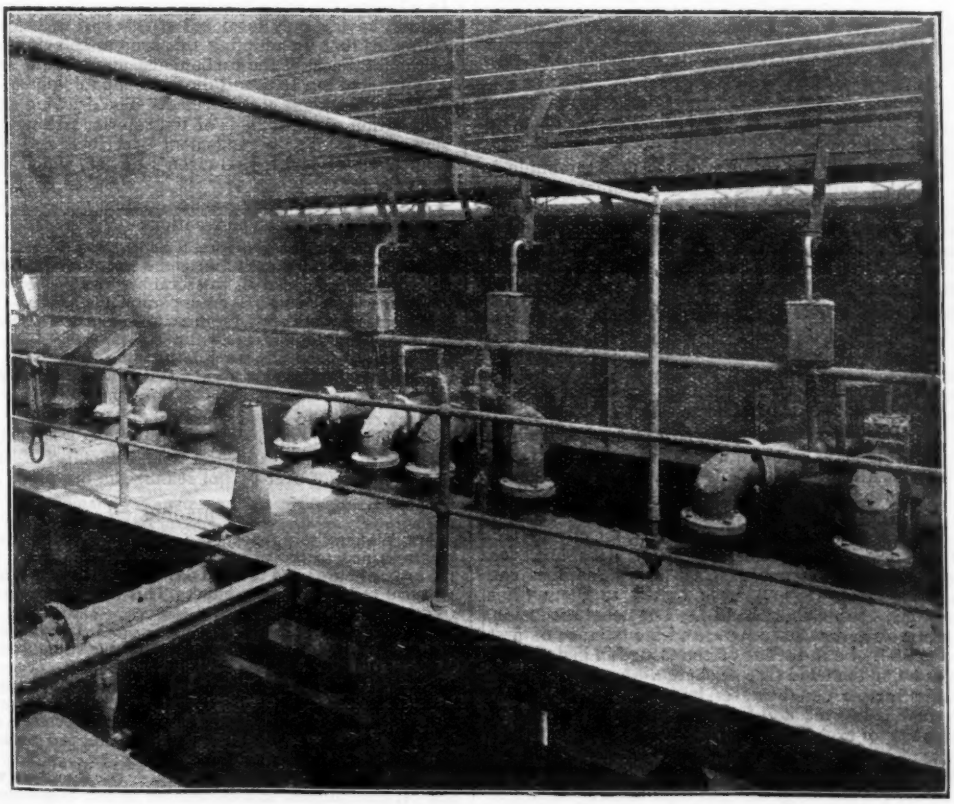
During the period in which the installation was under observation—*i.e.*, from March to August—many classes of coal, both English and foreign, were carbonized. Retort temperatures, mouthpiece yield, foul-main vacuum, and quality of gas were all subject to very considerable variation, yet no instance of a stopped pipe has been recorded. The temperatures of the gas in the arch-pipe, and that of the liquor circulated, varied between 180° and 200° Fahr. The quantity of liquor pumped was approximately 8 gallons per minute per standpipe. The liquor entering the standpipe contained 0·25 oz. of fixed and 0·6 oz. of free NH_3, while that leaving the standpipe contained 1·60 oz. of fixed and 0·6 oz. of free NH_3.

A film of light tar observed floating on the liquor in the seal trough led to the suspicion that the gas was being impoverished by being cooled in its nascent state. A number of analyses of the gas were therefore made, and (for comparison) simultaneous analyses of the gas from two neighbouring settings fitted with ordinary ascension pipes. The analyses in each case were of samples collected during the twenty-four hours, and were as appear in the tables on p. 726.

It will be observed that the percentage of the higher hydrocarbons in the inert free gas from the two systems was identical—the superior calorific power of the Congdon installation gas being due to the lower percentage of inert gases contained therein. This latter desirable state of affairs is due to the compensating effect of the common ascension pipe on the retort vacuum. The hydraulic main vacuum in each installation was the same.



Bench of Twenty Retorts fitted with Congdon Stand-Pipes.



TOP OF RETORT-BENCH FITTED WITH CONGDON STAND-PIPES.

CONGDON PIPES.

Sample.	Calculated B.Th.U.	Constituents.								Per Cent., C_nH_{2n} on Inert Free Gas.
		CO_2.	O_2.	C_nH_{2n}.	CO.	H_2.	CH_4.	N_2.	Inerts.	
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
1	571	3·82	1·82	3·46	7·46	45·68	30.85	6 91	12·55	3·96
2	602	2·19	1 64	3·28	6·73	44·50	34·93	6·73	10·56	3·68
3	605	2·19	0·55	2·73	6·93	47·72	35·37	4·51	7·25	2·94
4	627	2·46	0 56	3·22	7·01	43 86	37·59	5·30	8·32	3 51
5	572	2·19	0·55	2·37	7·64	49·14	32·34	5·77	8·51	2·59
6	613	3·09	2·00	4·00	7 28	42·81	34·67	6·15	11·24	4·51
7	606	2·55	0 55	2·55	6·72	44·00	37·10	6·53	9·63	2·82
8	556	1·82	0·37	3·28	6·73	48·08	29·34	10·38	12·57	3·75
9	605	1 62	0·36	2 73	7 09	47·16	35·46	5·58	7·56	2·95
10	..	1·82	0 55	3·09	6·55	Residual	Gas	Lost.	..	..
11	614	1·82	0·73	2·37	6·08	48·38	36·97	3·65	6·20	2·53
12	554	2 55	0·91	2·19	7 09	52·93	29·95	4·38	7·84	2 38
13	490	3·45	0·55	2·37	9·46	53·39	22·52	8·26	12 26	2·70
Average	585	2·43	0·86	2·90	7·14	47·30	33·09	6·18	9 51	3·19

ORDINARY PIPES.

Sample.	Calculated B.Th.U.	Constituents.								Per Cent. C_nH_{2n} on Inerts Free Gas.
		CO_2.	O_2.	C_nH_{2n}.	CO.	H_2.	CH_4.	N_2.	Inerts.	
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
1	521	3·64	0·73	3·46	6·00	43·68	27·06	15·43	19·80	4·31
2	498	4·37	1·46	3·28	6·73	36·67	27 17	20·32	26·15	4·44
3	488	4·19	1·09	2·55	6 57	40·24	26·82	18·54	23·82	3·35
4	528	3·18	0 56	3·00	5·46	44·24	28·82	14 74	18·48	3·64
5	517	3 12	0·73	2·57	7·31	44·72	27·95	13·57	17·42	3·11
6	494	2·55	1·46	2·19	6·55	45·03	26·74	15 48	19·49	2 72.
7	494	2·37	0·73	2·00	7 46	43·72	27·33	16·39	19·49	2·48
8	519	2·73	0·37	2·73	7·28	40·92	29·08	17·25	20·35	3·42
9	463	2·91	0 73	2·19	6·27	36·96	25·37	24·57	28 21	3·05
10	493	3·13	0 37	2·24	6·16	42·90	27·31	17·89	21·39	2·85
11	529	1 63	1·28	2·19	6·00	44·94	30·38	13·58	16·49	2 62
12	519	1·64	0·37	2·55	6·19	49·86	26·93	12·46	14·47	2·98
13	491	2·00	0·37	2·00	7·09	46·75	26·15	15·64	18·01	2·44
Average	504	2·88	0·79	2·53	6·47	43·13	27·55	16·60	20·27	3·19

Unfortunately, it was not possible to measure the gas from each installation.

A sample of the tar from the Congdon seal trough was next compared with a sample from the Congdon hydraulic main, and with one from the ordinary hydraulic main, for the content of oils to 180° C., with the following results.

WATER-FREE TAR.

—	Congdon Seal Trough.	Congdon Hydraulic Main.	Ordinary Hydraulic Main.
	Per Cent.	Per Cent.	Per Cent.
Oils to 180° C.	0·34	1·72	1·56

Again, unfortunately the respective total quantities of tar made could not be measured.

This inability to compare the volumes of gas and tar made in the Congdon settings, with the makes in the ordinary settings, renders the evidence inconclusive. There are, however, so many palpable advantages in the use of Congdon pipes, that the question of gain or loss of therms in the gas, in any case small, can be waived.

These advantages are:

1. A considerable reduction in labour is possible.
2. A set of anti-dip valves is incorporated (in effect).
3. Considerable load is taken off the outside condensing and washing plant.
4. The compensating action of the common ascension pipe, on the retort vacuum, is obviously beneficial.

Against these advantages one must set the cost of pumping, which would not be negligible in a large plant. The capital cost of converting the existing settings to the Congdon system is, however, high; and it might be considered prohibitive—the principal difficulty lying in the lack of uniformity which obtains in the disposition of bench-fittings that have been at work for any period. When a new retort installation is under consideration, however, quite a different aspect is observable. Cast-iron standpipes can be employed, with special mouthpieces bolted to them (thus eliminating the objectionable short bends). The usual ascension, bridge, and dip pipes are dispensed with, and the balance of first cost would undoubtedly be in favour of the Congdon installation—anti-dip valves being included free of charge.

The Congdon principle can however be used to much more advantage in a modified form; and from the point of view of first cost, it may be made an exceedingly attractive proposition. The stand-pipes, instead of leading the gas upwards to a conventional hydraulic main, may be terminated above the level of the top mouthpiece, and the gas led down to a gas-tight trough, formed of concrete below the stage level, and running the entire length of the bed. This trough functions as a hydraulic main (if a seal is to be worked), a foul main, and a Congdon trough. The series of separating tanks as used in the Congdon system lead off from this trough, and take the place of the conventional tar-tower.

By this arrangement the whole of the top work of the bench can be dispensed with, including:

1. Hydraulic and foul mains.
2. Ladders and platforms to same.
3. Ascension, arch, and dip pipes.
4. Tar towers and tar mains.

In addition, the cross bracing of the bench can be made materially lighter, having only tensional stresses to withstand. The writer estimates that by adopting this system a saving of about 15 p.ct. of the total cost of the carbonizing plant would be effected. It is also pointed out that anti-dip, unstoppable pipes, and condensing and washing plant are provided. The drawing shows a projected installation of eight beds of ten retorts, arranged on the descension system. The arrangement described and shown is really a refinement of Mr. I. J. Hanson's device, which was patented in the year 1885.

The patentee of the Congdon system makes the following comments on Mr. Hanson's invention:

> There was no provision for collecting the liquor and returning it through the pipes; and as the water and tar flowed with the gas instead of against it, the scrubber and cooler features were evidently inefficient. In my apparatus the gas and the tar condensed from it pass in opposite directions, and the cooler condensing or scrubbing liquor meets the coolest gas. The dip-pipe is far removed from any possible pitch or heavy tar; and there is no danger of getting too great a seal as would be the case in Hanson's apparatus.

With regard to the inefficiency of the scrubber and cooler features, this disadvantage is far outweighed by the other advantages already described; and the seal difficulty, if it exists, would naturally be got over by not sealing the dip-pipes at all.

DISCUSSION.

Mr. WARREN said that on the very day that the proof of his paper was returned to the printers, a failure in the liquor supply occurred for twelve hours; and the next day the whole of the pipes were stopped, and had to be cleaned by hand. This was, of course, not the fault of the pipes.

The PRESIDENT (Mr. H. G. Ruggles, of Leighton Buzzard) said they were greatly obliged to Mr. Warren for his valuable paper, which related to the most important part of the plant on every gas-works, and one which had been probably subjected to less change and development than any other. The system described was quite new to him, and no doubt to many others; and any processes which could be adopted to prevent the loss caused by stopped ascension pipes was worthy of every consideration.

Dr. R. LESSING (London) remarked that the paper was of particular and personal interest to him, because he had at one time been engaged in a law-case in which plant at the Atlanta Gas-Works was claimed to be an infringement of other patents standing in the names of the Riter-

Conley Company and Mr. H. A. Carpenter, of America. What he wished to draw attention to was a system of horizontal retorts to which he had referred on previous occasions, and which he thought deserved very much more attention than it had received. The reason for more attention not having been given to it was that the originator of the system—Mr. Carpenter—severed his connection with the Company owning the patents when about four or five plants had been built in the United States; and he having been the life and soul of the whole business, nothing more was done. It was really in consequence of this external circumstance that to-day they were hearing of Congdon pipes when the Riter-Conley ones ought at least to be mentioned, if not regarded even as the pioneers in this particular branch of retort-house construction. The law-suit, which was never carried to the Supreme Court, ended in a victory for Mr. Congdon, by saying that he had not infringed the older patents of the other side. Mr. Carpenter proposed to alter the whole setting-out of the retort-bench in a novel manner, doing away entirely with the arch of the setting. He built-up his retorts from blocks without the aid of any arch at all; and he did this up to a point in a very successful manner. First of all he converted old settings four retorts high, by connecting adjoining mouthpieces from two settings, and leading these eight retorts into one standpipe. A set of twelve retorts was then similarly dealt with, and finally one of sixteen retorts. He (Dr. Lessing) had little information about the working of the sixteen-retort setting, which was completed in 1917, because not a great deal was done with it. He believed there were some difficulties about the heating of the top retorts. But the most interesting feature of the whole thing was that the eight, twelve, and sixteen retorts were discharged into a standpipe on the lines suggested by Mr. Warren, without the aid of the intervening branch pipe. That was to say, the retort mouthpieces were directly bolted on to the ascension pipes which lead away the gas from eight, twelve, or sixteen retorts. There were a great number of details about the whole construction which he could not go into on this occasion; but he wished to draw attention to the matter, and thought constructing engineers might do worse than study the Riter-Conley patents, of which there were a large number. Such study should prove profitable to them, even if it was not a question of adopting the Company's system wholesale. They, for instance, worked most successfully the downward flow into a hydraulic main built underground. In one of the installations—that at Worcester (Mass.)—this plan had been followed. Of course, the question of pulling came in. He had given a great deal of time and labour to the problem of finding out what happened to the ascension pipe, particularly where several ascension pipes were led into one standpipe—say, 18 in. wide and of square or rectangular section—which acted as a buckstay for the whole setting. On the question of what happened in the standpipe, he did not quite see eye to eye with Mr. Warren or Mr. Congdon in looking upon the effect that came about as being one entirely of cooling. Cooling certainly did prevent the accumulation or deposition of scurf, or whatever it might be, in the ascension pipe; but the main advantage was rather one of mingling the products of carbonization at various stages during the period of carbonization. Where there were many retorts, there would, for example, be one which, having just been charged, was producing gas in large quantity, very rich, and containing the bulk of the illuminants, and so on. The gas make and the gas quality were going down as carbonization proceeded, until towards the end—say, half-an-hour previous to discharging—there was hardly any gas coming off, and that which was doing so was very hot. There was practically a vacuum in the retort, into which the furnace gases were drawn. They did not get any furnace gases into a retort which was in its first half hour, or first hour, of the carbonizing period, because of the large amount of gas that was being made. But the inerts were drawn in towards the end of the carbonizing period. Taking sixteen retorts, and adopting a system of charging in which there was a proper rotation, there would be half-hourly intervals between the chargings. Therefore, they would have at all times a retort yielding rich gas and one giving poor gas, a retort yielding plenty of gas and one giving little gas, discharging into this one common ascension pipe. Thus to a great extent the chemical reactions which were responsible for causing stoppages could not take place. He believed that the chemical sequence of the formation of a stoppage in an ascension pipe was that there was deposited at one period in carbonizing a pitchy matter from the gas. This pitchy matter had the lighter portion of tar or tar vapours distilled off it. It got partially thickened, and after this happened a new lot of gas came from the retort towards the end of the carbonizing. This new gas, being very hot, carbonized the pitch that had chanced to stick in the ascension pipe; and this happening every time the retort leading into this ascension pipe was charged, the pipe gradually got stopped. Another thing which had to be considered was that the decomposition which occurred in the retort—and particularly in partially filled retorts—was not completed. The time factor had not played itself out; and though the gas containing heavy tar matter was heated to the temperature, the tar molecules had not yet had time to decompose. They did so after they had left the retort; and therefore the question of velocity of gas from the retort into the ascension pipe must be taken into account. These were minor matters to the mind of the ordinary gas engineer; but he ventured to suggest that if these ideas were followed up, and consideration were given to construction on these lines, a good deal might yet be done with horizontal retorts. And, of course, from a different point of view all these things applied identically to vertical retorts or other systems. He would like to refer to one other point, which might be of interest, and had some historical value. Mr. Warren said he had no record as to the success or failure of the system of Mr. Wates. He (Dr. Lessing) believed he could supply the lacking data. Dr. Carpenter, of the South Metropolitan Gas Company, was the draughtsman who made drawings of this system. The process was under the ægis of Mr. Chester, late of Nottingham, and nothing had come of it. Up to a few years ago, Dr. Carpenter had not been able to trace that a plant was ever erected.

Mr. A. E. BROADBERRY (Tottenham) remarked that Dr. Lessing had rather led them away from the subject of the Congdon pipe to the Riter-Conley settings. When he (the speaker) went to America last year, one of the things he wanted to see was the Riter-Conley settings. He found when he got there that the Riter-Conley Company was a huge manufacturing concern, with a splendidly equipped works; and just about the last thing they thought of was the Riter-Conley retort-setting. He went to Worcester (Mass.) and Chester (U.S.A.), where they had these settings of eight tiers of retorts going right away up into the sky. They could imagine the difficulty there would be in charging the topmost retort, which was somewhere about 20 ft. from the stoking floor. For this purpose it was necessary to have a very big stoking machine indeed. He did not know how much short of 100 tons in weight it was; but it cost over £20,000 of English money at the present rate of exchange to build it; and they realized then that, if anything went wrong with the machine, the whole house would be standing idle, and with high settings such as these they were likely to get into trouble. So they had to build another one. This stoking machine was really a most wonderful piece of apparatus. It was controlled by a lot of electrical contacts; and the machine could not work until the last lid was shut or opened. Until it was in exact alignment with the retort for operating, the electrical contacts were not complete, and the machine was unable to work. When it got into line, it worked very nicely; but they experienced a certain amount of trouble with the heating. In fact, at Worcester they had to give it up. When he went to Chester, they were just starting again, and were claiming to be getting very good results; but on his visiting the Riter-Conley works, they did not seem to be particularly interested in retort-settings. They did not think the system was going to be popular; and this was the feeling with most engineers at the time in the United States. But the Congdon pipes did seem to be growing in popularity there; and though they were not by any means general at the present time in the States, nearly all the men who were using them spoke well of them. The only thing was that it was necessary to have great floods of water going down; and in the case of a large retort-house, it was difficult to imagine what amount of pumping machinery would be required. One thing he noticed in Mr. Warren's paper which rather puzzled him was when he spoke of circulating the liquor. They simply pumped the same liquor round and round. Then lower down he gave some figures as to the amount of fixed and free ammonia contained in the liquor. The free ammonia remained the same in the liquor constantly circulating; they would expect it to be so. The first figure for fixed ammonia was 0·25 oz., the second was 1·6 oz.; so it seemed to be progressing. But the author did not say at what point he found 0·25 oz., and at what point it was 1·6 oz. If the same liquor was circulating constantly, apparently the fixed ammonia would go on increasing. In how many hours of circulation did it work-up from the 0·25 oz. to 1·6 oz.?

Mr. W. W. TOWNSEND (Colchester) said that, as one who had had experience with anti dip valves of various kinds—starting with the one invented by Mr. R. O. Paterson, of Cheltenham, he knew what stopped pipes meant, and all the difficulties one had with lightly-charged retorts and high heats. He was rather interested to see the statement in the paper that: "At the junction of each connecting pipe with the common ascension pipe is a simple and reliable valve for use when charging retorts." He thought, "At last we have it;" but later he read that this simple and reliable valve was giving all sorts of trouble. "The valve gear, being of decidedly flimsy construction, was given short shrift at the hands of none too sympathetic stokers," &c. This was, he thought, the *crux* of the matter with regard to the system. They must have some means of shutting-off the retorts while charging; and this means must be simple and reliable. It seemed to him that any sort of valve he had seen would be a great nuisance attached to each mouthpiece and to the Congdon scrubber pipe. Looking into the matter still further, one arrived at the conclusion that there were going to be certain objections to any system of this kind; but if one had a retort-house where there was a tremendous lot of trouble with stopped pipes, it was going to be worth while to make the alteration. He ventured to suggest, however, that there was a far better way of getting over the difficulty, and that was to have conditions which did not give stopped pipes. They heard from Mr. Glover and others years ago how to do this; and he could confirm it from his own experience. At Beckton, they had large retorts with one ascension pipe, and that was at one end. They were bound to have stopped pipes with high heats under these conditions. The Fiddes-Aldridge machine was an excellent one; but it would not put in a full charge. In his own works they had retorts 24 in. by 16 in. by 22 ft. long, with a 7-in. ascension pipe each end; and they worked without seal and with heavy charges. They had adopted the only form of anti-dip arrangement he considered of any use—that was the sliding-sleeve (Cort's) anti-dip. They worked with absolutely level gauge under these conditions. He asked before leaving the works that morning, and found they had had two stopped pipes since last January. This included working through the coal strike, and partly with foreign coal. He excepted one particular pipe, which had had to be cleaned at least two dozen times, and this was because the anti-dip on the one side came off the lever, and so was put out of order, and they had to work with one ascension pipe. He was working with unscreened Durham coal passed through a breaker. If one visited a works like these, and saw the absence of pumps, valves, and circulating liquids, he did not think one would be inclined to adopt any such system as had been described that day. He did not, of course, say there would not be instances in which this form of stand-pipe would be very useful; for circumstances altered cases. There must, however, be a valve connection; and this must give trouble. Something must collect there. He did not quite like the idea of bolting the Congdon pipes right-up to the retort mouthpieces. How were they going to manage when the bench got hot and expanded—with the mouthpiece firmly bolted to the retort one side and to the standpipe on the other. He was not much impressed with the idea of having a descension system at all. They took the mains from where they were not in the way, and put them in the cellar where it seemed to him they would be very much in the way, especially on the furnace side of the house. He added that the carbonizing temperature at Colchester was 950° C., and the weight of coal carbonized 34 cwt. per retort per day. So it could not be said their freedom from stopped pipes was due to low temperatures being worked. One of the great advantages of the Congdon standpipe was claimed to be the reduction in the inerts in the gas, due to equalization of pressure in the retorts. But

this advantage could also be obtained by working the ordinary system without a seal.

Mr. J. H. TROUGHTON (Newmarket) said many of them had had trouble with stopped pipes, especially during the strike; but with careful attention, and having discarded a lot of leaky mouthpieces, he had more or less got over the difficulty. The paper read that day was hardly one which could be of much practical service to managers in the Eastern Counties, who had generally to deal with small works.

Mr. WARREN, in reply, said Dr. Lessing and Mr. Broadberry had been telling them about American practice. It had always been his own opinion, and he had heard it expressed by others, that Americans had the habit of spending their money without always considering whether it paid or not. But in this particular instance there was distinct evidence that it did pay; and this was the reason why Congdon pipes were picked out from American practice for trial here. Mr. Broadberry asked a question as to the strength of ammonia pumped. The loss of ammonia from the seal tank was made up with the addition of water, which was added from a ball-valve in the seal tank. These two samples were taken, one at the top of the stand-pipe, and one at the bottom before the liquor reached the seal tank, and when the strengths of the liquor had arrived at a period of equilibrium, and would not be altering any more. At any time that they took a sample at the top or bottom of the standpipe, they would find that the tests were the same. The addition of water was constant, and the loss of liquor was also constant. He mentioned that it was water, because the strength of the liquor seemed so low, considering that it was constantly circulated; but it was also constantly weakened by the addition of this water to make up the loss of liquor. Mr. Townsend criticized the valves, which he (the speaker) had called simple and reliable. He was, however, referring to the existing state of affairs, and not to the condition of things when they were put in. They discovered where they were unreliable, and remedied the trouble. Mr. Townsend said that one must shut the valve to charge the retort. The main trouble with the valves arose from the fact that the stokers were too lazy to shut them when they charged a retort, and consequently they got set. The corollary one would draw from this was not to have a valve at all. They had worked whole houses unsealed, without any valves, and with great satisfaction. Mr. Townsend thought stopped pipes were really not a difficulty, as he said they depended upon conditions. If one was trying to get the utmost throughput with a house, and working it at extreme temperatures their materials would stand, and carbonizing as much coal per 24 hours as possible, they would find that they were bound to get trouble, whether they had one, two, or any number of pipes. They must auger them, or get stops; and this cost money. As far as expansion of the stand-pipes went, this consideration had troubled them very much when they installed them, and provision was made in the flange of the short bends by slotting the holes; but, as a matter of fact, they never moved. This might be due to the fact that the stand-pipes were made of thin material, and were able to become slightly distorted, and take-up the expansion that way. But personally he did not think the expansion question was very terrible, because it was only between each retort. As to the advisability of putting the hydraulic main in the stoke-hole, this was perhaps a matter of opinion; but numbers of people had been much troubled with thick tar, which simply arose from putting the hydraulic main at the top of the bench. Whenever they had to clean-out the thick tar, men had to work in a hot and inaccessible position. At the bottom of the house the hydraulic main would keep cool; and if it needed to be cleaned, it would be a very easy matter to do. It was in a place where it could be looked after and generally cared for. This, in his opinion, was infinitely better than putting it on top of the bench.

Mr. TOWNSEND repeated that the temperature he carbonized at was 950° C., so that it was not a question of avoiding stopped pipes by having low heats. They were getting 13,000 c.ft. per ton: and he thought his make of gas was about 19,000 c.ft. per retort. He therefore claimed that one could get a good make and a good output per bench, and have no stopped pipe trouble, if one put in very heavy charges, and had two pipes.

Mr. WARREN: But you have to pay for the pipes to be augered.

Mr. TOWNSEND: The stokers simply have to push the auger up before charging.

Mr. WARREN: Possibly you could do with fewer stokers, if they did not have to do that.

Power Plants and Fire Prevention.

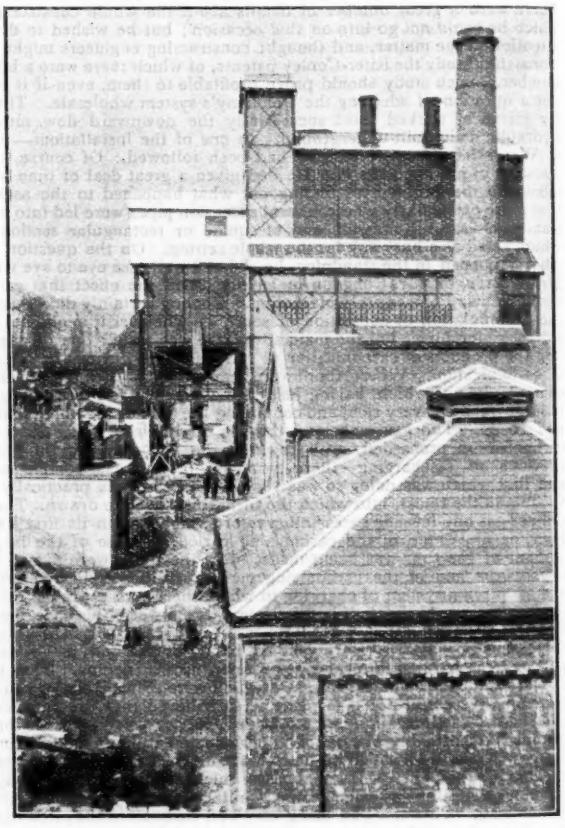
The National Safety Council of the United States, dealing with common preventable fire causes, say, in connection with gas-engines, that care should be taken that the exhaust pipe from each engine is muffled, and that no wood or combustible partition is near the exhaust. If, however, an exhaust pipe passes through a combustible partition, the woodwork must be protected. This may be done by providing a double thimble made of two concentric rings of sheet metal, with at least 1 in. air space between, and with the outer ring covered with asbestos, or else a casing of solid masonry. Ventilation through the opening is essential. The principal hazard from power transmission is that of overheated shaft-bearings. Serious fires have frequently resulted from this cause. Shafting out of line quickly causes overheated bearings. There is danger also when any material becomes wound about the shaft, as it may rub against adjacent parts of the structure. The hangers and bearings should preferably not be near woodwork. Roller or ball bearings are desirable; but where these are not used, self-oiling bearings are recommended. Frequent inspection should be provided beneath all bearings; and these should often be emptied, to prevent oil dripping on the floor or inflammable material below. Probably the next most important cause of fire in the transmission of power is that of belts rubbing against woodwork. Wherever belts pass through wooden floors, walls, or partitions, ample clearance should be provided, so that the belt will not rub against the woodwork.

GLOVER-WEST VERTICALS AT PORT GLASGOW.

Opening of the New Gas-Works.

There was a notable gathering last Wednesday of the principal Scottish gas engineers and municipal dignitaries at the opening of the new gas-works at Port Glasgow—the town on the River Clyde from which the great city of Glasgow took its name. The carbonizing system is that of Glover-West vertical retorts; and, although the original estimate was £60,000, it is expected that the total cost will not be less than £105,000. At the start, Provost Mackie (the head of the Municipality), in welcoming the company, said the new works were the "last word in Scottish gas-works." The company then made a tour of inspection of the works.

The installation of vertical retorts comprises twelve retorts to be operated on the Glover-West system of continuous carbonization. The most interesting feature of this system is the method of applying heat to the retorts. The Glover-West retort-setting is divided by vertical division walls into a series of heating chambers, each supplied by separate vertical fuel-gas uptake, and each containing, in the Port Glasgow plant, two retorts. The heating chambers again are divided by horizontal partitions or floors into combustion chambers separately fed from the uptake flue, and separately controlled. This arrangement of heating is particularly well adapted to modern requirements, in that the distribution of heat throughout the length or height of the retort is perfectly under control.



Glover-West Vertical Retort Installation at Port Glasgow.

It may be regarded as certain that the practice of continuously introducing steam to generate water gas—particularly at the base of the retort—simultaneously with the process of carbonization, has come to stay. In view of the fact that there is a definite limit of temperature below which water gas cannot be generated without a considerable increase in the proportion of the incombustibles added to the gas, it becomes a necessity to be able to adjust the temperature of the several portions of the retort, not only to suit the particular coal being dealt with, but to secure the largest volume of gas without increasing the inert constituents. A further consideration with regard to "steaming" is that in any case the temperature must be greater towards the base of the retort than was necessary for dry distillation. The settings at Port Glasgow are designed to meet this condition also. Before being introduced into the retort, the steam passes through a series of superheaters arranged in the base of the chimney, where a portion of the heat of the waste gases is transferred to the steam.

The external features of the Glover-West benches are well known. It is sufficient to recapitulate them, and to indicate how they have been adapted to the conditions of the actual installation at Port Glasgow. The coal is brought on to a siding of the

Caledonian Railway, where the contents of the wagons are discharged by means of hydraulic wagon-tippers into a receiving hopper of some 8 tons capacity. From this hopper the coal is mechanically fed to a powerful coal-breaker, and thence to a gravity bucket coal-conveyor, by means of which the broken coal is raised to, and distributed in, coal-bunkers placed above the retort-bench, and capable of containing coal for 48 hours' supply to the retorts. Vertically over each retort the bunkers are provided with an outlet in communication with a gas-tight coal-valve, through which about three hours' supply of coal is passed to a coal-feed hopper which is in direct communication with the retort below. As coke is extracted from the base of the retort, the coal flows in from the coal-feed hopper above.

The coke is removed from the base of the retort by the helical or corkscrew extractor which, with its speed adjustments and safety devices, is a well-known feature of this system. Its adoption in upwards of a hundred installations proves the successful solution of the difficult problem of coke extraction. The coke is fed by the extractor to a chamber containing about two hours' make of coke, and fitted with an asbestos packed gas-tight outlet door with eccentric fastenings, similar to the ordinary horizontal retort mouthpieces. The coke from the chambers will be periodically discharged and fed to the gravity bucket conveyor, which will elevate it to a 50-ton coke storage hopper conveniently placed above the railway siding, with outlets to the wagons. The outlets are fitted with screen-shoots to separate the breeze before dispatch. Coal and coke is thus handled mechanically in and out of the works.

As an alternative, the conveyor is arranged with long shoots to deliver coal to a substantially built coal-store alongside the retort-house. From the store, coal will be drawn in wagons to a lift or direct to the conveyor. Coke may also be dealt with in the lift. Thus a complete system of stand-by plant is provided for both coal and coke.

The whole of the coal and coke handling machinery is electrically operated; the power being taken from the local supply, in the form of three-phase alternating current at 440 volts. Each motor has an oil-immersed starter; and the usual distribution switches and safety devices are provided. The coke-extractors, however, are actuated by gas-engines in duplicate.

The coke supply to the producers is taken from the coke-storage hopper at the level of the producer charging stage. That for filling the retorts at starting is taken from the same source, and elevated in the lift at the top of the retort-bench. The lift, which also forms a convenient means of access to all the operating platforms of the installation, is electrically operated and controlled by a push-button in the cage. The lift frame, as well as the cage, is fitted with collapsible gates, all electrically connected with the controller, so that the lift-cage cannot be in motion until the gates are closed. Thus all possibility of risk to life and limb of the workmen is obviated.

The condensers are of the water-cooled type, by Messrs. Henry Balfour and Co. There are four new purifiers fitted with Messrs. Clapham Bros.' patent "Eclipse" joint and a Weck patent valve. The gasholder is a spiral-guided one of two lifts in a steel tank. It has a capacity of 500,000 c.ft., and was built by the Barrowfield Iron-Works, of Glasgow. The pressure-governor is of Cowan's well-known water-loading type.

[The general arrangement and some details of the installation were shown in drawings published with Mr. R. W. Cowie's Presidential Address to the North British Association of Gas Managers in September last year. See "JOURNAL," Vol. CLI., p. 500.]

At the subsequent luncheon, Mr. F. J. West and Colonel D. Laidlaw made suitable presentations, on behalf of the Contractors, to the Provost and ex-Bailie Steele, who has been Convener of the Gas Committee for the long period of seventeen years.

Mr. West paid tribute to the great assistance he had received from gas engineers in improving the Glover-West system in past years. Provost Mitchell (Greenock) with ex-Bailie Dick (Port-Glasgow) spoke in complimentary terms of the satisfactory carrying-out of the contracts. They expected to get a third more gas out of the coal with a smaller wages bill and a saving in cartage. Mr. J. W. M'Lusky (Glasgow), who was introduced as an old Port-Glasgow boy, expressed himself as confident of the success of the new works under the *régime* of Mr. R. W. Cowie (the Gas-Engineer), who had done splendid work.

Recovery of Gasolene from Natural Gas.—The systems in use in the United States for obtaining gasolene from natural gas are the absorption method and the compression method. The former is employed for the dry gas, and the latter for the wet gas which occurs with oil. It is said that the removal of the gasolene does not harm the gas, but, in fact, actually improves it for all uses to which the distributing companies put the gas, as the water is taken out as well as the gasolene, and the water has always proved harmful, inasmuch as it disintegrates the rubber gaskets and causes leaks in the lines. The United States Geological Survey give the following production figures of gasolene recovered in the year 1919: From petroleum, 3 833 672 295 gallons; from natural gas—by absorption method, 92,377,439 gallons; by compression method, 261,157,587 gallons. The average gasolene yield per 1000 c.ft. of gas treated was 0·74 gallon.

SULPHUR REMOVAL BY OIL-WASHING.

By E. R. HAMILTON, Superintendent to the Nova Scotia Tramways and Power Company, Ltd., Halifax, Nova Scotia.

[A Paper read at the Canadian Gas Association Convention.]

A year ago at the meeting of this Association,* it was stated that if the laboratory results on oil-washing for sulphur removal were borne out in practice, the sulphur problem at Halifax would be solved. In a preceding paragraph of the paper, a number of anticipated difficulties were pointed-out. The results of actual experience have shown that some of these were real, while others have proved to be negligible; and in their place new difficulties have developed.

The equipment used at Halifax for oil-washing is practically the same as originally planned. There are three steel tower scrubbers, 4 ft. diameter by 16 ft. high, connected in series by a 12 in. pipe. These at first were entirely filled with wooden grids; but now part of the wooden grids have been taken out and "Excelsior" grids substituted. Thus each scrubber has four layers of "Excelsior" about 21 in. deep, carried on wooden grids 12 in. deep, giving a total depth of scrubbing material of 11 ft. 6 in. By the substitution of "Excelsior" for the wooden grids, it is estimated that the scrubbing surface has been increased over three times the original area of 3000 sq. ft. per tower.

The oil is circulated through the towers by means of small, electrically-driven gear pumps. It was planned to re-circulate the oil in the first two scrubbers to the full capacity of the pumps; but the results proved this to be bad, for saturated oil was brought in contact with the partially purified gas, and the absorption was reversed. To avoid this, dumping boxes were arranged for each scrubber, in order to give sufficient volume of oil to obtain an intermittent spray, and the oil pumped to each of them successively. The rate of flow of oil is controlled by an orifice on the discharge pipe from a small tank directly over each dump-box. The pumps deliver an excess of oil, which flows back to the receiving tank from which it was pumped; and in this way a constant head is kept on the orifice, and the operation of the pump observed.

The oil used for washing is refined from a parafine base crude, and is sold under the the trade name of "Pale Parafine Oil." While this is a high-grade lubricating oil, our laboratory tests have shown that its absorption capacity for carbon bisulphide is equal to that of kerosene, gas oil, or crude oil, which, because of our geographical location, would cost us practically the same. The slightly heavier body makes it easier to pump. The freezing point is 26° Fahr., or practically the same as that of gas oil or straw oil. Another factor about this oil which is particularly desirable is that it does not easily emulsify. Only once during the past six months have we had trouble with an emulsion; and this we believe to have been due to stirring-up a large amount of fine carbon, which had been deposited in the oil by the tar-still while repairing one of our storage tanks. This carbon apparently acted as the necessary agent to bring the oil and water together; but the regular steam distillation of the oil was quite sufficient to separate them.

After passing through the scrubbers, the oil is collected in a receiving tank near the still, until there is sufficient to handle. As was stated a year ago, it was thought that the dehydrating and dephlegmating column on the tar-still would prove large enough to drive off all the carbon bisulphide; and this has proved to be the case. The column is 3 ft. diameter by 9 ft. high, and consists of five sections. The three lower sections have steam coils; and in addition to these there is a live steam connection into the middle section above the level where the saturated oil is admitted. Steam at 120 lbs. pressure is used on the coils, in addition to the small quantity of live steam admitted. The live steam serves to reduce the vapour-tension of the light oils that have been picked up in the wash-oil; so that distillates up to 140° C. are given off, as well as carbon bisulphide. The upper part of the middle section and the two top sections form a dephlegmator in which the vapours and steam are reduced in temperature to 210° Fahr., and then pass to a water-cooled worm-condenser. A vertical vent pipe connected at the inlet of the condenser takes away nearly all the carbon bisulphide, so that we obtain a fair grade of crude benzole after separating it from the condensed steam.

The production of benzole amounts to about half a gallon per ton of coal carbonized. While this figure is low, it does not represent an attempt on our part to extract benzole primarily; and our yield is subject to considerable fluctuation, depending upon how fast, and at what temperature, we distil the wash-oil. Generally the wash-oil is pumped through the still at 300 gallons per hour, and is raised in temperature to 270° Fahr. The operation requires the attention of one man for about four hours to handle a batch of 1000 gallons of oil. This time includes the preliminary warming-up of the still, and pumping a finished batch to the re-distilled oil storage tank. The main body of the tar-still serves as the first receiver of distilled oil, which is allowed to stand in here for twenty-four hours to effect partial cooling.

The chief difficulty with the whole oil-washing process has been in the temperature control. Due to the high vapour tension of carbon bisulphide, the temperature must be kept down. The best operating condition would be 60° Fahr., or under, if it were

* See "JOURNAL," Vol. CLII., p. 333.

possible. In fact, our best results have been obtained in the fall and spring, when uniform atmospheric conditions served to reduce our cooling problems to a minimum. In severe winter weather, the oil tends to freeze; while in the summer it is too hot to be effective. To overcome this, we have housed the scrubbers and installed heating coils for cold weather, and evaporating cooling coils for the oil in hot weather. We have found that the temperature control of both oil and gas must be regulated to one or two degrees. In no other way are we able to account for the variable results in the efficiency of the absorption. Very often we have found that the process has reversed and carbon bisulphide has increased, because of a rise in temperature combined with a variation in the mixture of the coals being carbonized. Some of the best absorptions have occurred when the carbon bisulphide has been exceptionally high; so that in this respect the process has acted as a balance wheel and equalized, as well as reduced, the sulphur content of the gas.

The rate of flow of the oil affects the absorption, but not as much as the temperature. We have varied the rate from 1·5 to 7·5 gallons per 1000 c.ft. of gas, and have obtained good and poor results with all. The best absorptions have been obtained with an increased flow of oil; but this necessitates an ample supply of oil, added work in distilling it, and much increased capacity for cooling it. Results indicate that 8 gallons or more per 1000 c.ft. are essential to obtain 50 p.ct. reduction in the sulphur content at the ordinary temperatures—that is, from 70° to 75° Fahr.

We have not found that there is any serious reduction in the heating value of the gas due to the scrubbing. The maximum effect occurs when fresh oil is introduced into the system; and then the reduction may amount to from 20 to 25 B.Th.U., until the oil becomes saturated. The rapid distillation of the wash-oil tends to leave considerable toluole and benzole in it; so that its stripping effect on the gas is very much lessened.

It is our experience that the Cape Breton coal breaks down into naphthalene very easily under our system of carbonization. With a temperature gradient of 2100° to 1800° Fahr. from the bottom end to the top end of our inclined retorts, there is a strong tendency to form naphthalene. The oil-washing system has been a very decided help in overcoming this trouble and allowing us to raise the temperature in the retorts and increase our yield from this coal by over 10 p.ct. Sufficient naphthalene is distilled over with the light oils so that the wash-oil remains practically uniform in composition, showing no sign of thickening or sludge. It was thought that the "Excelsior" in the scrubbers might act as a filter to accumulate naphthalene sludge; but there has been no indication of this after four months' continous operation, and the back-pressure has not increased.

Because of the naphthalene which is carried over in the steam distillation with the crude benzole, we have found it desirable to mix with it an equal volume of gasolene before using it for motor fuel. Previous to mixing, we found that in cold weather the naphthalene would crystallize-out in the feed-pipe, particularly in the vacuum feed pipe of the carburettor, and shut-off the supply to the engine. The mixture of gasolene and crude benzole with a properly adjusted air supply to the carburettor has proved to be very satisfactory.

Considerable mechanical loss of wash-oil has taken place; but this has been largely overcome by careful inspection of joints and stuffing-boxes. Fresh oil has been added from month to month, to make-up for the losses; but it has not been necessary to re-distil or filter any wash-oil because of accumulated heavy tar-oils or naphthalene sludge, as had at first been anticipated.

The expense of operating this system has been high; but it has not required the extensive plant necessary for the catalytic system, nor the constant attention of an operator. During the past ten months we have put through the scrubber 70 million c.ft. of gas, varying in sulphur from 35 to 160 grs. per 100 c.ft. The reduction has been from 5 grs. on the first to 60 grs. on the latter, with an average flow of oil in each case of 4·5 gallons per 1000 c.ft. of gas. As has been pointed-out, the results have been irregular; but this may be accounted for by the temperature control upon which we are still working. During the ten months, we have used up 3000 gallons of wash-oil, and have obtained as a credit against this 3000 gallons of crude benzole. The average expense per 1000 c.ft. of gas, based upon the figures for the month of June, is 3·34c., including labour, power, steam, and oil losses, against which we have a credit of 1·53c. per 1000 c.ft. of gas for crude benzole, making the actual cost 1·81c., without interest and depreciation charges. As this is figured on a month of low production, 6,870,000 c.ft., and the oil-loss charge is pro-rated for the ten months and represents nearly 50 p.ct. of the expense, it is evident that considerable reduction is possible in the cost with increasing send-out and smaller oil losses.

Our laboratory tests show the freezing-point of fresh wash-oil to be −3° C.; and after continued use and re-distillation, it decreases to −5° C. The specific gravity of this oil is 0·885. Analyses of the wash-oil to determine the increase in sulphur have not proved satisfactory, because the different methods employed have not checked well against each other. The combustion method with sodium peroxide has shown 0·303 p.ct. sulphur in the fresh oil, 0·347 p.ct. sulphur in the re-distilled oil, and 0·432 p.ct. sulphur in the saturated oil. These figures indicate the relative absorption of carbon bisulphide in the scrubbers and its liberation during the steam distillation.

Our experience with the oil-washing process for removing carbon bisulphide from coal gas has shown us that the method is feasible, and for a small plant compares favourably with any of the more elaborate systems. As has been emphasized several times, the temperature control is the chief problem to be dealt with. With this matter solved, the whole process then becomes automatic.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents*]

Broken Coke for Ordinary Grates.

SIR,—I have been somewhat interested in recent articles and correspondence in the "JOURNAL" dealing with the use of coke as a domestic fuel. Technically, I know nothing of the subject; but I think I can claim some slight practical knowledge gained from the exclusive use of gas coke for heating purposes in my home for more than four years. I adopted coke as a fuel in March, 1917, "since when I have used none other."

My "special apparatus" consists of two ordinary open kitchen grates and the usual type of register grate found in cottage bedrooms—all probably over forty years old. Provided that dust is not allowed to accumulate so as to choke the flues, I have experienced no drawbacks, except that a good fire *must* be maintained, and that the heat generated is apt to be somewhat oppressive in damp weather. I have never noticed any smell of sulphur in a room in which coke was burned in an open grate.

While stove manufacturers will naturally boost their wares, I consider that gas managers might push coke, broken to a reasonable size (say, over 2-in. and through 2½-in. screens), and well washed, for use in the ordinary household grates, with good prospect of permanently capturing a large part of the domestic fuel market, without waiting for that remote time when the open fire shall have given way to elaborate schemes of central heating.

JOHN ROBSON.

5, *Ambrose Terrace, Friar Gate, Derby, Sept.* 24, 1921.

Cripps's "Flow of Gas" Diagrams.

SIR,—In looking over some old letters, I came across one from the late Professor R. H. Smith, of which I enclose a copy, and which, as you will see, is an able mathematical analysis of my diagrams on the "Flow of Gas."

Professor Smith was one of the leading authorities on stresses in engineering structures, and the author of "Graphics"—one of the most advanced books on the subject.

It occurred to me that you might like to publish the letter in the "JOURNAL."

F. S. CRIPPS.

Horsham, Sept. 13, 1921.

Copy of letter received from the late Prof. ROBERT H. SMITH, Assoc.M.Inst.C.E., M.I.M.E., Mem. Order Meiji, &c.

April 22, 1897.

Dear Mr. Cripps,—I have only to-day had time to look through your paper, and to study your very clever and ingenious diagrams. In practical knowledge about gas-mains and their working, I am very deficient. But I thought it might interest you to offer you a note on the purely mathematical aspect of your calculations.

The formula you work from is

$$V = 1350\, s^{-\frac{1}{2}}\, p\, l^{-\frac{1}{2}}\, d^{2\frac{1}{2}}$$

which, taking logarithms, may be written

$$\log. V = \log. 1350 - \tfrac{1}{2} \log. s + \tfrac{1}{2} \log. p - \tfrac{1}{2} \log. l + 2\tfrac{1}{2} \log. d.$$

Starting from the right-hand end of your diagram, you have adopted a uniform vertical scale for V. So that, if you plot-off horizontally a scale of reciprocals of square roots of numbers, and mark these numbers at the points, this will serve for a scale of specific gravities; and each diagram connecting the various possible V's and S's for a given set of values of p, l, and d, will be a straight line; because for such a given set of p, l, and d, you have $V = \frac{\text{Constant}}{\sqrt{s}}$

The different straight lines correspond to different values of

$$\left\{1350\, p^{\frac{1}{2}}\, l^{-\frac{1}{2}}\, d^{2\frac{1}{2}} = V s^{\frac{1}{2}}\right\}$$

Each point on the vertical left-hand edge of this section of your diagram may be looked on as the end of one of these straight lines. I observe that the oblique lines you have drawn-in correspond to values of

$$\left\{1350\, p^{\frac{1}{2}}\, l^{-\frac{1}{2}}\, d^{2\frac{1}{2}}\right\}$$

equal to $(.4)^{\frac{1}{2}} \times 5$, 10, 15, 20, 25, &c.

Along this vertical edge between the "Specific Gravity" and the "Pressure" sections of your diagram, you have evidently a *uniform* scale of values of

$$\left\{1350\, p^{\frac{1}{2}}\, l^{-\frac{1}{2}}\, d^{2\frac{1}{2}}\right\}$$

Now this quantity varies as $p^{\frac{1}{2}}$, so that if horizontally you plot-off a scale of square roots, and name the successive points of the scale as corresponding pressures, you will get straight-line diagrams across it.

Thus your "specific gravity" horizontal scale is one of *reciprocals* of square roots; and your "pressure" horizontal scale is one of square roots.

For the left-hand section, your fundamental law may be written $\log. l = 5 \log. d +$ a Constant for each given set of values of V, s, and p. For any such set of special values of V, s, p the relation between the possible l's and d's is such as to make the increase and decrease of $\log. l$ and $\log. d$ keep in the constant proportion 5. Thus if you plot horizontally the logs. of l's and vertically the logs. of d's, you will

obtain a straight-line diagram to represent each group of V, *s*, *p*. In this section both vertical and horizontal scales are logarithmic.

As you mentioned that you had actually found these various scales by a process of trial, I thought it might interest you to recognize how they could easily be obtained by direct use of tables of square roots, reciprocals, and logarithms.—Yours, &c.,

(Signed) ROBERT H. SMITH.

How to Burn Coke—A Correction.—Dr. J. T. Dunn, of Newcastle-on-Tyne, calls attention to the fact that, by a printer's slip, the word "dioxide" was, in the ninth line of his letter appearing on p. 663 of last week's "JOURNAL," transformed into "monoxide." The sentence should read: "In what does the advantage of this process over that of burning to carbon dioxide directly consist?"

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Sept. 21.]

Nos. 24,148 to 24,741.

CLARKE, C. E.—"Atmospheric gas-burner." No. 24,519.
CLARKE, C. E.—"Gas-cooking stoves." Nos. 24,520, 24,521.
CLARKE, C. E.—"Gas heating-stove." No. 24,522.
CLARKE, C. E.—"Gas heating apparatus for the central heating of buildings." No. 24,523.
DALLAS, J.—"Plug gas-cocks." No. 24,460.
DUCKHAM, Sir A. M.—See Woodall, Duckham, and Jones. No. 24,631.
HEALY, J.—"Device for indicating the quality of gas generated in suction-gas plants." No. 24,406.
LUTZ, H. E.—"Retorts for distilling carbonaceous material." No. 24,232.
PARKINSON STOVE CO., LTD.—"Fire-grates." No. 24,157.
SOUTH METROPOLITAN GAS COMPANY.—"Means for emptying containers." No. 24,651.
WELLS, J.—"Gas producers." No. 24,430.
WELLS, J.—"Apparatus for cooling and cleaning gas." No. 24,432.
WOODALL, DUCKHAM, AND JONES (1920), LTD.—"Retort-discharging devices." No. 24,634.

Lewes Gas Company.

Mr. Edward Monk presided at the meeting of the Company last Wednesday, in the unavoidable absence of Mr. J. Miles (the Chairman). In their report for the half year ended June 30, the Directors stated that the revenue account showed a profit of £2754; and after providing for all calls upon it, the net revenue left a balance of £1495. Owing to the recent coal strike, the Directors were unable to carry out the renewal of certain mains intended to be done during the past half year; but the work was now in progress, and would involve considerable expenditure. Dividends were recommended for the half year at the rates of £3 15s. p.ct. on the original capital and £2 12s. 6d. p.ct. upon the additional capital stock. Moving the adoption of the report and accounts, the Chairman said that, just as two-and-a-half years ago they met under the shadow of pessimism, now the shareholders should be warned against undue optimism. Though the Company had had a good half year, it must be borne in mind that residuals were now coming down in value. Alluding to the effect of the coal dispute, he said strikes seemed to be the spade used by the working man to dig his grave in the burial ground of unemployment; but despite all the vicissitudes that many concerns—private and domestic—had experienced, it was a matter for congratulation that the Company, unlike many less fortunate undertakings, had been in a position to supply all the gas demanded, though there had been days of great anxiety. They had received the consent of the Board of Trade to the payment of the dividends recommended. The report was adopted.

Aged Gas Workers.—The Walsall Corporation Gas Committee have considered the list of old workmen who have been in their service for a considerable number of years, and who from age and infirmity cannot do an average day's work; and they have received a deputation from the men's Union on the matter. The Committee have decided that all the old workmen who are eligible for an old-age pension shall retire and receive that pension; and that the Committee shall also make an allowance of 10s. per week, or such sum as is permissible under the Old Age Pensions Act. The Committee have fixed the wages of the other men affected; and their services will be continued while they are capable of doing work.

Lighting of Lamps in Kensington.—The General Purposes Committee of the Kensington Borough Council report that they have for some time past had under consideration an offer made by the Gas Light and Coke Company for taking over the street lighting by gas of the borough, the work connected with which is at present carried out by direct labour. The offer of the Company was for a period of ten years. Having regard to the abnormal conditions at present prevailing, the Committee have not felt in a position to advise the Council to accept the offer made by the Company, but have postponed consideration of the question for a period of twelve months. It will, of course, be open to the Company to submit to the Council a further offer at the expiration of this period; and in order that the Committee may be in a position to deal with any such offer, they have given instructions for the Council's expenditure on public street lighting by gas to be separately allocated during the ensuing twelve months.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under section 1 of the Gas Regulation Act.

Drighlington and Gildersome Gas Light Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 10d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 11 6d. per therm.

Ely Gas and Electricity Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 7½d. per therm.

Sittingbourne District Gas Company.

The statutory maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

SPECIAL ORDER.

Stafford Corporation.

Application is intended to be made by the Corporation for a Special Order under section 10, to empower them to borrow further money for the purposes of their gas undertaking.

DECLARATION OF CALORIFIC POWER.

Haslemere and District Gas Company.—450 B.Th.U. (Oct. 1.)
Ilfracombe Gas Company.—425 B.Th.U. (Sept. 29.)
Irthlingborough Gas Company, Ltd.—460 B.Th.U. (Oct. 1.)

GAS REGULATION ACT ORDERS.

There have been forwarded by the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Burgess Hill and St. John's Common Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 20d. per therm. (Sept. 20.)

Ilfracombe Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 19·2d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-two-thirds.

Prepayment meter clauses are included. (Sept. 19.)

BRITISH GAS LIGHT COMPANY, LTD.

Annual Report of the Directors.

In the report to be submitted at to-day's annual general meeting, the Directors of the Company regret to announce that Mr. R. S. Gardiner, who was for twenty years a Director, has, acting under medical advice, retired from the Board. The Directors are sure the shareholders will join with them in the hope that, by the lightening of his business responsibilities, Mr. Gardiner's health may be completely restored. They have appointed Mr. Henry Pullman, J.P., to fill the vacancy.

The results of the year's working have been affected by the three months' coal strike, which commenced on April 1. At all stations except Hull, the Company have been unable to earn the interest authorized by Parliament, by reason of the maximum price of gas being inadequate. The Directors made application to the Board of Trade for Orders under section 1 of the Gas Regulation Act, 1920; and at Norwich and the Potteries Orders have been granted under which gas will in future be sold at these stations on a "therm" basis, and the maximum price chargeable is increased. Consequent upon the Orders, the price has been advanced; and it is hoped that the full interest authorized by Parliament will in future be earned. Before long Orders will doubtless be granted by the Board of Trade for the Trowbridge and Holywell stations.

After providing for interest on debentures and debenture stock, the net revenue amounted to £34,691, which, with the undivided balance brought forward from the preceding year, left an available balance of £103,360. From this sum, the Directors have paid the dividend at the rate of 7 p.ct. per annum on the cumulative preference shares, and an interim dividend at the rate of 5 p.ct. on the ordinary shares. They now recommend that the payment of these dividends be confirmed, and that a final dividend on the ordinary shares at the rate of 5 p.ct., less income-tax, making 10 p.ct. for the year, be paid on Oct. 7. This will require the sum of £19,950, and leave a balance of £56,758 to be carried forward.

The total gas sold increased by 4·38 p.ct. on the sale for the year to June, 1920.

Under the provisions of the Public Utility Companies (Capital Issues) Act, 1920, the Company obtained a consent from the Board of Trade, dated April 12, 1921, under which the Company were authorized to increase to 7½ p.ct. per annum the rate of interest on the sum of

£70,500, being the balance of the sum of £100,000 authorized to be borrowed on mortgage under the Company's Norwich Act of 1918. Of this sum £29,500 was raised in 1920 at 6 p.ct.; and the balance of £70,500 was offered to the shareholders and debenture holders last May at 7½ p.ct. The Directors are pleased to report that the balance has been allotted.

At a special general meeting held on March 16, the shareholders approved a Special Order empowering the Company to expend additional capital on the Staffordshire Potteries undertaking. The Order has now been duly made by the Board of Trade, and approved by Parliament.

The County Borough of Stoke-on-Trent are still very desirous of acquiring the Potteries undertaking, which is practically in the centre of their Federated Borough. The position is now such that the Directors will ask the shareholders to pass a resolution empowering them to part with the undertaking, should an adequate offer be received.

PRIMITIVA GAS COMPANY OF BUENOS AYRES.

An Improved Position.

In a circular to the shareholders (issued in compliance with the promise made by the Chairman at the last general meeting that any information available should be given them as soon as the results of the Company's operations for the first half of the present year were known), the Directors announce that the working results in Buenos Ayres for the six months ended June 30 show a profit of about £25,000, as compared with a loss of £23,830 in the corresponding period of last year. This profit is, of course, before deduction of debenture interest and fixed charges in London.

The profits now being made, though small, are increasing each month; and, as good English coal is procurable at prices substantially below those ruling for several years past, there is every reason, it is stated, for hoping that the long series of losses is ended, and that the undertaking will gradually make progress towards recovery.

Price of Gas in Wandsworth.—The Wandsworth Borough Council have received notice from the Wandsworth, Wimbledon, and Epsom District Gas Company of an increase in the price of gas by 2d. per therm (from 1s. to 1s. 2d. per therm Wandsworth limits), as from the Midsummer quarter. The additional cost of gas for street lighting will be £1029 to the end of the present financial year.

Brief Gas Supply Failure at Carnoustie.—Owing to the collection of water in a main-pipe at Carnoustie, the gas was cut off at about 9 o'clock in the evening on the 20th inst., and all the lights in the burgh were extinguished. In a few minutes, however, Mr. John Ireland (Gas Manager) found the cause of the trouble, and the pipe was pumped clear, with the result that the lights were soon relit.

POWER GAS FROM SEWAGE.

The following is the text of the paper read by Mr. J. D. WATSON at the recent Edinburgh meeting of the British Association, some extracts from which appeared in last week's issue of the "JOURNAL."

Recent experiments at Birmingham have shown that it is practicable and economical to drive a suction gas engine with gas derived from sewage sludge. That organisms acting upon decaying vegetable matter have contributed to the formation of gas capable of being put to use, is not unknown to the scientific world; but to employ gas emanating from sewage sludge to drive plant which forms an essential part in an installation for the purification of sewage, is an achievement calculated to interest the economist.

In a sewerage district of 115 square miles, it is evident that some of the sewage, particularly the solid matter contained in it, must undergo partial decomposition before reaching the outfall. It is obvious, therefore, that the system which frees the liquid as speedily as possible, and subjects solids to intensive fermentation under strict control is an acceleration of Nature's methods; but it is not, as some have suggested, one of auto-digestion.

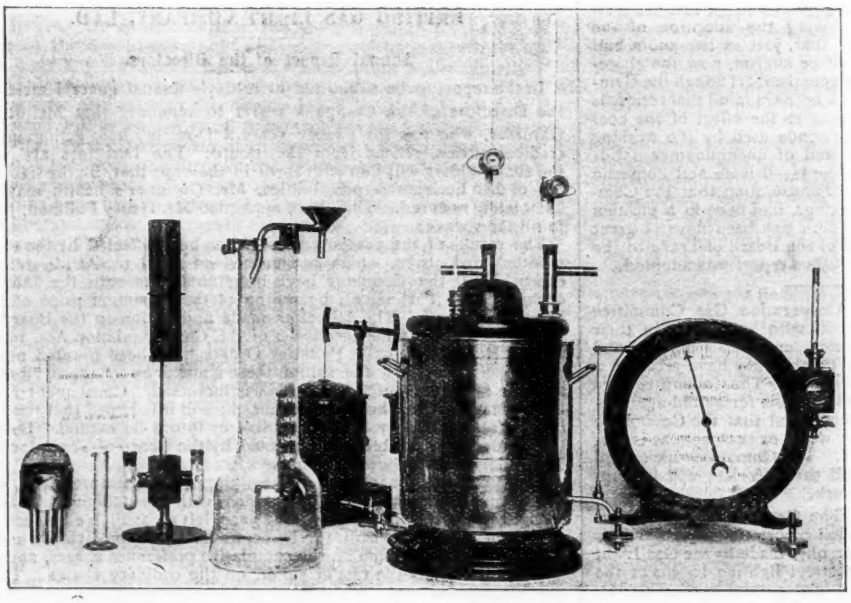
In 1904 the author called attention to the fact that foul sludge, which had attained a certain stage in Nature's putrefactive change, ceased to give off fœtid smell. He did not attempt to explain the phenomenon; but the observation has confirmed the suggestion that the presence of H_2S rarely obtains unless the liquid portion of the sewage is also present. This observation was subsequently confirmed where Imhoff tanks were adopted in Germany and America; and it also accords with the experience gained at Parramatta in Australia.

The volume of wet sludge dealt with at Birmingham is not less than 400,000 tons per annum. Similar volumes are sent out to sea from Glasgow and Manchester, and correspondingly less from Dublin and Southampton. But from London, not less than 2,000,000 tons are shipped out to Barrow Deep, twenty miles east of Southend, every year. The author estimates that from Birmingham alone 9000 tons of dry solid matter are available to produce 320,000,000 c.ft. of gas, which is equal to 16,000,000 horse-power-hours, taking 20 c.ft. per brake-horse-power-hour—equivalent to 4400 H.P. per day of ten hours.

If one were to be guided by the yield of gas from sewage at Parramatta, these power estimates would be considerably higher; but, even after allowing for errors in calculations, the volumes of sludge capable of being gasified in our great cities are startling. What is possible in a climate like Australia, however, is not necessarily obtainable here; and the author has therefore confined himself to facts and experience obtained from Birmingham sewage. The experimental station forms part of an auxiliary works in course of construction at Cole Hall, where neither electricity nor coal gas was available for power. The pumping installation comprises a 34 B.H.P. horizontal gas-engine of the ordinary suction type, made by the National Gas Engine Company, a

BOYS CALORIMETER.

Gas Referees Latest Pattern.



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into
TOTAL HEAT
B.Th.Us.

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WESTMINSTER.

5 in. diameter centrifugal sludge pump, a sludge pump-well, two sludge digestion tanks for generating the gas, and a gasholder. The plant is designed in order to give 25 B.H.P. for a working period of six hours a day.

It should be observed that the plant is working under many disadvantages at present, which would not have been the case had there been more knowledge of the subject available when the plant was designed, and more confidence in the ultimate success of the experiment. The gasholder, which is an essential feature of a smooth working plant where gases of varying quantity have to be evenly diffused, is not yet put up; its erection having been delayed until the result of the experiment justified the expense. Notwithstanding drawbacks, the material fact arising out of the experiment is the successful trial run of the engine and pump, and the low cost of gas production. In speaking of the trial run, the makers of the engine state: "We naturally expected that adjustments and modifications would be required to the standard arrangement; but, to our surprise, our engineer was able to start-up with the sewage gas quite satisfactorily within five minutes of the time he arrived in the engine-house. After running light for a few minutes, the full load available was put on, and the engine ran satisfactorily without further adjustments, with an average of 60 to 70 explosions per minute, representing 17 to 18 B.H.P."

The engine is the Company's standard town-gas engine, capable of giving 34 B.H.P. (maximum) at 250 R.P.M., with town gas having a calorific power of 500 to 550 B.Th.U. per c.ft. Judging from the experience already obtained, there is every reason to expect gas of a higher calorific value—probably 650 to 700 B.Th.U. Given a regular supply of gas, perfectly satisfactory results are assured; and it may be assumed that the engine will require no more attention than the standard gas-engine working on town gas. As a precaution, cams were provided ready to be fitted in case the calorific value was appreciably lower than anticipated, and lower than that usually supplied to such engines from the Birmingham Corporation mains. The makers state that the town gas usually consumed by an engine of this size is at the rate of 10,000 B.Th.U. per horse power-hour; and as the actual load given out was not less than 18 H.P., it is obvious that heat was supplied from the material available at the rate of at least 180,000 B.Th.U., or 1·8 therms per hour.

The following data are taken from the test run, to which the makers of the engine refer, though better runs were made subsequently: Morning: Length of continuous run, 2½ hours; indicated horse power, maximum 27½, minimum 13, average 15; horse-power-hours, 33. Afternoon: Length of continuous run, 1¼ hours; indicated horse power, maximum 32, minimum 20, average 24; horse-power-hours, 30.

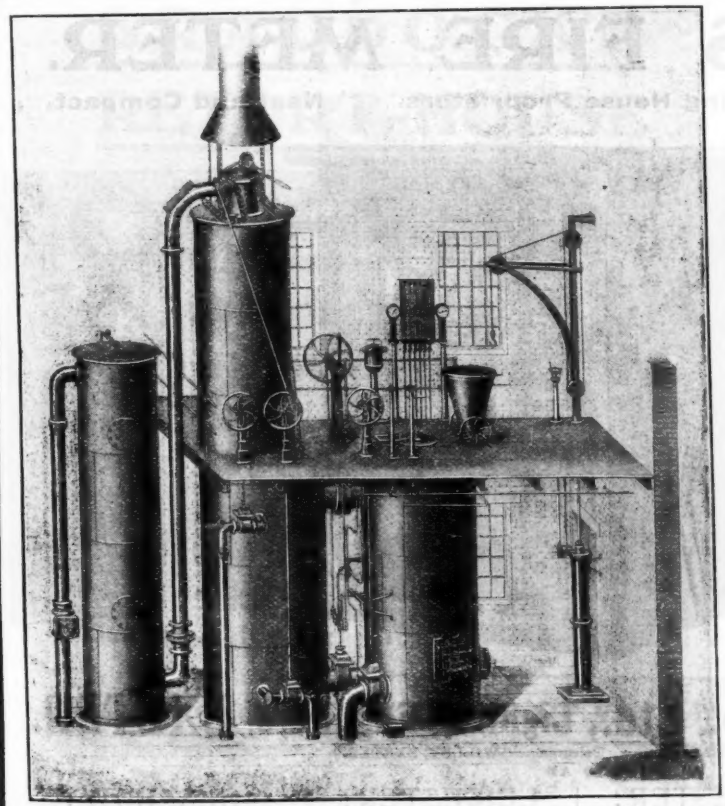
The principal constituents of sewage gas are methane, hydrogen, nitrogen, and carbon dioxide; but it is the marsh gas or methane upon which we chiefly rely. The following statement gives the proportion of marsh gas found in various septic sewages in England, America, Australia, and India.

	Per Cent. Marsh Gas.
Exeter (Donald Cameron)	20·13
Exeter (Donald Cameron)	24·4
Matunga (C. C. James)	21·25
Matunga (C. C. James)	23·9
Lawrence (Massachusetts State Board of Health)—	
Septic tank A	79·0
Septic tank B	37·5
Septic tank F	75·9
Parramatta (Septic Gas Company of Australia)	60·0
Birmingham (J. D. Watson)	43·3

The majority of these results were obtained from septic sewage; but the author is of opinion that it is from sewage sludge, and not from liquid sewage, that a sufficient volume of gas can be obtained to render power from sewage reliable and economical—particularly in this country, where temperature is so variable and so frequently and persistently low. One of the remarkable features of the temporary engine-house is the entire absence of smell—good, bad, or indifferent. On reflection, this may be no more than one would expect, as the gas forming the explosive mixture is chiefly methane mixed with atmospheric air in the proportion of 1 to 6 or 1 to 8, depending on the quality of the gas.

The author submits this communication to prove that it is practicable, and, where the conditions are favourable, economical, to utilize gas emanating from sewage to drive an ordinary suction gas engine. It is too early to dogmatize upon what are most favourable conditions; but the Birmingham case shows that it is not necessary to possess the climate of India or Australia to obtain power gas from sewage. He submits that it is the duty of every local authority, in these days of enforced economy, to see that the gas which has hitherto been disposed of as something which is of less than no value, is utilized when possible and practicable.

Gas for Municipal Houses.—The Ministry of Health have agreed to arrangements being made upon the following terms with the Wandsworth, Wimbledon, and Epsom District Gas Company for the installation of gas to the houses being erected on the Furzedown and Watney Estates by the Wandsworth Borough Council: (*a*) A sum of £10 per house to be paid to the Company in respect of houses distant more than 25 yards from existing mains, and £5 per house within the said distance of an existing main, for carcassing to not less than ten points per house, laying the necessary service-pipes, extending mains, and executing all the work necessary to afford a supply of gas. (*b*) The above-mentioned sums to be based on a present-day estimate of the cost of service-pipes and carcassing, and to be varied *pro rata* with rises or falls in the cost of labour and materials. They are contributions towards the service-pipes and internal work.



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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 26.

The London tar products market is steady. Pitch is being shipped to the Continent, and new inquiries are on the market for export. Creosote is somewhat scarce, as makers are well sold and stocks are believed to be unusually low. There is considerable demand for benzole, toluole, and solvent naphtha; but generally prices are unaltered.

Sulphate of ammonia for home farmers is selling at the prices proposed by the Federation. For export, the tendency of prices is upward.

Tar Products in the Provinces.

Sept. 26.

The average values for gas-works products during last week were: Gas-works coal tar, 52s. to 56s. Pitch, East Coast, 67s. 6d. to 72s. 6d.; West Coast—Manchester, 67s. 6d. to 70s.; Liverpool, 67s. 6d. to 70s.; Clyde, 67s. 6d. to 70s. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 8⅝d. to 9d.; salty, 8d. to 8¼d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is a very fair business passing in tar products, although values are somewhat in advance of the ideas of buyers. Outputs continue to remain small; but more blast-furnaces are being blown-in, so that more trade for the coke-ovens is likely in the near future. This should bring about a much improved feeling in the tar products markets. The outlook for pitch, however, does not appear very good at the moment. Industry must have cheaper fuel generally, and cheaper fuel means, of course, cheaper patent fuel. On the other hand, there is a likelihood that more pitch will be used on the roads during the course of finding work for unemployed through the winter. Prices are nominal, and range from 77s 6d. to 85s. Naphthalenes are neglected, without much demand for refined qualities, which make £15 to £17 per ton. Crudes continue in fair demand on account of the fire-lighter industry, and make from £5 10s. to £8 per ton. Creosote is fairly steady on a moderate demand for the quantity available. A normal output, however, would have a detrimental effect on prices, which are now in the neighbourhood of 8½d. per gallon. Trade in carbolic acid does not revive. Crudes are hardly quoted, and crystals are reported sold at about 6d. per lb. Supplies of solvent naphtha are more plentiful, although parcels are taken at 2s. 5d. per gallon on rail. Heavy naphtha is about 2s. 6d. White 90 p.ct. benzole is difficult to obtain, and probably 3s. per gallon is fair value. Pure benzole is scarce at 3s. 6d. A fair inquiry continues for the leading intermediate products, and moderate business is passing. Salicylic acid has been wanted, and the upward movement noted last week has been continued; prices being 1s. 5d. per lb. for technical grade. Aniline oil and salt remain in demand at 1s. 7d. and 1s. 8d. per lb. respectively. Technical resorcin is 5s. 6d. per lb.; beta naphthol is 2s. 6d. per lb.; and anthracene 40 to 50 p.ct. is 9d. per unit.

Sulphate of Ammonia.

There is not much fresh to report in this material; the demand continuing fair both for this and next year's shipment, with a slightly better tendency regarding price. The home trade is quite moderate, a few of the country dealers taking this material into store in anticipation of higher prices when the consumption season commences in earnest. The following prices are fixed for October: Neutral quality, basis 25⅝ p.ct. ammonia, £14 13s.; ordinary quality, basis 25¼ p.ct. ammonia, £13 10s. per ton. Export is being done in the neighbourhood of £16 per ton.

TRADE NOTES.

[For "Journal" Advertisers.]

Fletcher Gas Apparatus.

Illustrated particulars of the "Fletcher" patent indestructible gas cooking-ranges, the hot-plates of almost all of which are fitted with their patent "Perfect Grill" reversible burner for boiling and grilling simultaneously, are to be found in a new booklet (List No. 263) issued by Messrs. Fletcher, Russell, & Co., Ltd., of Warrington. There are the "Standard," "Palatine," "Housewife," and "Kensington" series, with various other special types, as well as hot-plates of all sizes for boiling and grilling, water-heaters of different patterns, together with many other of the firm's specialities. In the "Palatine" cookers, there is a new series, in construction similar to the older type, but having on the hot-plate an improved arrangement of burners, which are nicely graduated for various purposes. List No. 264 of the same firm deals with gas-grates, of which the new "Historic" series ("Radiation" standard pattern) embodies all the latest improvements, including silent non-lighting-back burners, new radiant pillar fuel, patent injector ventilating arrangement, and patent adjustable flue-nozzle—the last-named facilitating fixing in front of coal-grates with

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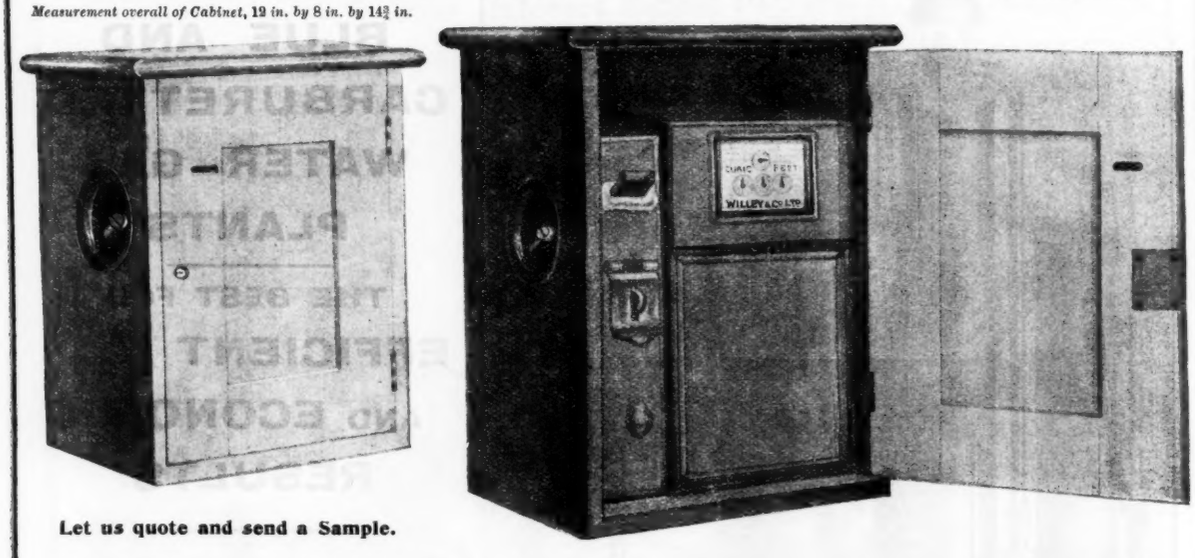
Measurement overall of Cabinet, 12 *in. by* 8 *in. by* 14⅝ *in.*



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low canopies. There is also a wide choice of other patterns of attractive design.

Cubic Feet and Therm Comparisons.

Messrs. Sawer and Purves, of Nelson Meter Works, Miles Platting, Manchester, have prepared, mounted on a stiff cardboard, a useful table giving a comparison of the price of gas per 1000 c.ft. and per therm. The prices per 1000 c.ft. included a range, in 3d. stages, from 7s. to 3s.; and the corresponding prices per therm are given for gas of calorific standards between 400 and 550 B.Th.U.—the figures being calculated out for each 10 B.Th.U. within these limits. In this way, there are sixteen prices per therm shown for each of seventeen different prices of gas.

Gas Employee Charged with Theft.—At Hendon, last Thursday, Thomas J. Wheatley, in the employ of the Gas Light and Coke Company, was charged with stealing £12 18s. 2d. For the Company, it was stated that the amount had reference to the meter at Wheatley's house. They had had great difficulty in obtaining access to his house; no fewer than 25 calls being made. An appointment was then made; but the meter was empty. When told he would be arrested, he offered to pay the amount owing. A fine of £5 was imposed; and Wheatley was ordered to repay the debt by weekly instalments of £1.

Public Lighting Question at Haltwhistle.—An adjourned parish meeting has been held at Haltwhistle to consider further the question of public lighting next season. A letter was read from the Gas Company that the price of coal had been reduced since their last meeting, and quoting £3 4s. 6d. per lamp—a reduction of 3s. per lamp on the previous tender. Mr. James Irving said he was glad a concession had been made; but he could not call it a liberal one. Believing that the monopoly of the Gas Company might be broken down in a shorter time than some thought, he moved that £550 be raised to meet expenses under the Lighting and Watch Act. The resolution was carried unanimously.

Dorking Gas Company.—The accounts submitted at the meeting last Thursday stated that, after providing for interest on the debenture stock, the balance available for dividends was £2519; and the Directors recommended, subject to the approval of the Board of Trade, the payment of dividends at the rate of 4 p.ct. per annum on the different classes of shares, leaving £1519 to be carried forward. The Chairman (Mr. Herbert Young) said that they had experienced a very trying time, owing to the disastrous coal stoppage; but the town could be congratulated upon the fact that the gas supply was not cut off, nor was it curtailed to any great extent. This must have been due largely to the energies of the Engineer and Manager (Mr. John Urquhart). There had been a satisfactory increase in the quantity of gas sold. The report was adopted; and Mr. Urquhart, in consideration of his services during the past seven years, was appointed to the Board, as Managing-Director.

Ministry of Health and Sinking Funds.—The Smethwick Corporation report that, the gas sinking fund being in excess of requirements, an attempt has been made to obtain the sanction of the Ministry of Health to the suspension of payments thereto. After some correspondence on the subject, it has been intimated that, while the Ministry are not prepared to grant this request, they will not object to sums in the sinking fund being used for new capital purposes. This concession extends to the whole of the funds of the Council.

Gas Light and Coke Company's Finances.—The following is taken from the City Notes of the "Evening Standard:" "For some time past it has been rumoured that the Gas Light and Coke Company would follow the example of the South Metropolitan Gas Company, and make an issue of debentures. Report now says that the Company are in such a strong financial position that a further increase of cash resources would become a burthen. We state this with all reserve."

Price of Gas at Bangor (co. Down).—Mr. Fegan, the Chairman of the Bangor (co. Down) Gas Committee, has given notice, in the name of a Sub-Committee who had considered the question, to propose a reduction in the price of gas by 1s. per 1000 c.ft. as from Oct. 1, which would, he said, make the price the lowest in Ireland, except in case of Belfast. The reduction would mean a charge of 5s. 3d. per 1000 c.ft., which would be further reduced by discount to ordinary consumers to 5s., with more liberal terms to users of large quantities.

Nantwich and Gas Charges.—At a meeting of the Nantwich Rural Council last week, the Clerk reported that he had received notice of the Nantwich Urban Council's application to the Board of Trade for an Order to provide for the modification of the provisions of section 23 of the Nantwich Urban Council's Act of 1903, so as to authorize them to make charges for gas not exceeding 7s. 6d. per 1000 c.ft., instead of 5s. Mr. B. Jackson observed that when the Urban Council obtained powers to supply various townships in the rural area, they had a larger plant than was necessary to supply Nantwich. He did not see why gas should not be supplied at 5s. It was decided, by sixteen votes to four, to object to the application.

Gas Apparatus Hire Charges in Wandsworth.—The General Purposes Committee of the Wandsworth Borough Council report that they have considered a letter from the Wandsworth, Wimbledon, and Epsom District Gas Company, in reply to the communication from the Council relative to the alleged excessive charges made by the Company for the hire of gas stoves, meters, &c., stating that the Directors do not agree with the conclusions arrived at by the Sub-Committee of the Standing Committee on the Investigation of Prices under the Profiteering Acts; that it is not the intention of the Company to take any action in the way of re-imbursement, as suggested in the Council's letter; and that the Council may rest assured that any miscalculation is not to be applied to the Company in the matter. The Committee recommend that a copy of the correspondence between the Council and the Gas Company on the subject be forwarded to the Board of Trade.

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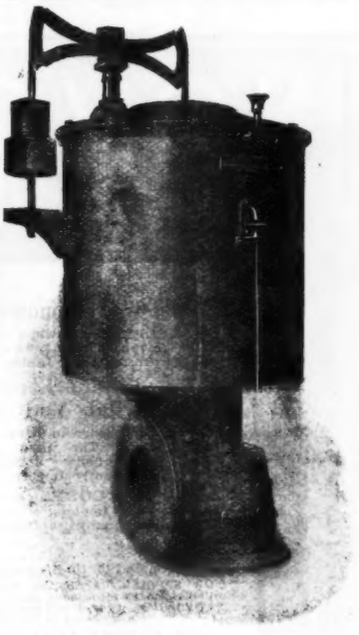

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Pinafore Catches Fire at a Gas-Stove.—The Manchester Coroner (Mr. C. W. W. Surridge) returned a verdict of "Accidental death" at an inquest on Louis Ashworth, aged twelve months. The child was left in the house under the charge of his sixteen-year-old sister, who, after lighting the gas-stove, left the room for a few minutes. During her absence, the child went to the stove and his pinafore caught fire. Mr. Surridge emphasized the advisability of leaving some responsible person in charge of children whenever there was a fire or lighted gas in the room.

Automatic Lighting Experiment.—The General Purposes Committee of the Wandsworth Borough Council report that they have considered a letter from the South Metropolitan Gas Company, applying for permission to fit all the public lamps in the Streatham Ward with apparatus for lighting and extinguishing by clockwork mechanism, in order to make an extended trial of the system, and to ascertain whether any saving can be effected thereby. The Committee recommend that permission be granted, subject to the whole of the work being carried out to the satisfaction of the Borough Engineer, and to the apparatus being removed, and any damage made good, in the event of the system proving unsatisfactory.

British Gas-Mantles.—The General Purposes Committee of the Wandsworth Borough Council have considered a letter from the Joint Industrial Council for the Gas-Mantle Manufacturing Industry, asking the Council, as a measure against unemployment in the industry, to put forward the claims of the British-made gas-mantle, to use their influence to encourage its sale, and to insist upon its use in all street-lighting contracts. The Committee recommend that the Council be informed that British-made mantles are used for public lighting in the borough; and that it is the policy of the Council to give fair preference to tenders submitted by British firms for the Council's requirements, and as far as possible to use British materials for Borough Council work.

Gas-Tap Causes a Fatality.—An Uttoxeter lady named Richardson, 77 years of age, met her death under sad circumstances at Burton-on-Trent, where she had gone to spend a day or two. The friend she was visiting found her a room in a neighbour's house, and on taking a cup of tea to her bedroom turned out the gas at Miss Richardson's request, and left her with a lighted candle. Next morning Miss Richardson was found unconscious, with the room full of gas; and she expired the following day. The friend told the Coroner that the gas-bracket in the bedroom differed from the one in her own house, and she had never handled it before. She turned the tap until it would go round no farther. A Juryman who had examined the tap said he found the fitting to be the same as thousands of others—it could be turned past the stop one way. After giving medical evidence, Dr. Clements said he had also seen the gas-bracket, and could easily have made the same mistake himself. It was the natural way to turn the tap; but when it was turned as far as possible, the gas was full on, whereas one would think it was off. The Jury returned a verdict of "Accidental death."

Stealing Money from a Meter.—Charged with having stolen 25s. from an automatic gas-meter, the property of the Newcastle and Gateshead Gas Company, Peter Brown appeared before Gateshead Magistrates, and pleaded guilty, saying that he was drunk when he did it. Gilbert Wilkinson, a meter-inspector in the employ of the Company, went to the house and found the meter had been broken open, and all the money, with the exception of 1d., removed. The register showed that 4200 c.ft. of gas had been consumed, representing a sum of £1 5s. The damage was estimated at 9s. Accused was bound over in the sum of £10, and ordered to pay the amount missing and costs.

The address of Mr. H. E. Jones, Mr. F. H. Jones, and Mr. George Evetts is now Nos. 159-162, Palace Chambers, Bridge Street, Westminster, S.W.1.

The Spenborough District Council have obtained permission from the Ministry of Health to borrow £24,000 for alterations, extensions, and improvements in connection with the Heckmondwike and Gomersal gas undertaking.

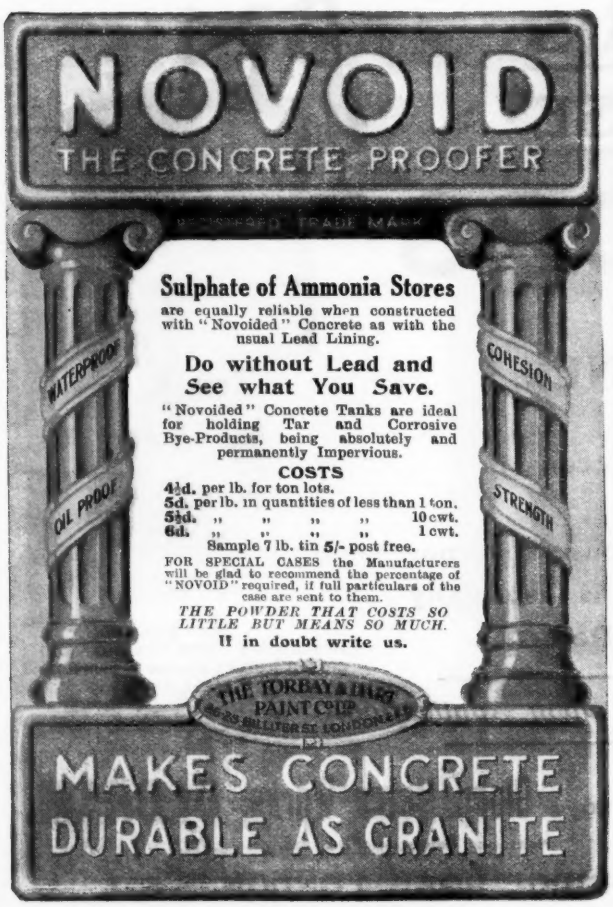
The Alford Urban Council have, after prolonged negotiation with the local Gas Company, obtained a reduction in the cost of street lighting compared with that of last winter, which amounts to more than a halfpenny rate.

It has been decided by the Walsall Gas Committee that in future, when a net profit is made in any year's working of the gas undertaking, provision shall be made, as far as practicable, for charging income-tax in respect of the year's profits in the accounts for that year.

The employees of the Manchester branch of Messrs. George Wilson Gas-Meters, Ltd., had their annual outing last Saturday week at New Brighton and a very enjoyable time was spent. The sports held in the afternoon proved quite an attraction, and added very much to the amusement. Among other prizes a cup and medals were put up for competition.

An inquest was held at the Bradford Coroner's Court on the body of Levi Barstow, who was found dead seated in a chair, with a cloth upon his head, and his face bent over a gas-ring. The gas was on full. A verdict of "Suicide while of unsound mind" was returned. George Stoyles, a Bradford labourer, was found dead in bed with one end of a gas-tube in his mouth and the other end attached to the gas-bracket, the tap of which was turned on.

At an inquest at Skinningrove, near Middlesbrough, last Thursday, on two men who were asphyxiated in a cabin at the Skinningrove Steel-Works, it was stated that the cabin was not far from some gas-producing plant not at present in operation because of the partial idleness of the works. After the occurrence, traces of gas were found in an underground sump which ought not to have been there. There might have been a leakage, it was added, and the gas might have filtered through the ground.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MAKES CONCRETE
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FOR
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is a colourless solution which imparts a smooth, sanitary, dust and damp-proof effect to an otherwise brittle and porous surface, setting as hard as a rock yet retaining its elasticity.

The concrete dust nuisance is even more serious than the porosity of concrete, for the slightest mechanical friction produces an annoying and insanitary dust, which becomes a serious menace to health, as these concrete "atoms" are full of microscopical crystals of silicate from the crushed stones, which inflame the mucous membrane of the throat and nasal organs, and are also very injurious to fine machinery.

'Everok' knits the "atoms" together and forms a hard coating that actually becomes an integral part of the conglomerate, especially if applied to a freshly laid surface.

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STOCK MARKET REPORT.

THE Stock Exchange has had another week of paucity of business, coupled with general dullness pretty well all round. Neither home nor foreign affairs offered any pleasing attraction; and the maintenance of the 5½ p.ct. Bank rate on Thursday caused disappointment.

The gilt-edged market was heavy, and in Home Government issues Consols alone picked up a little. The Friday figures for the big four were: Consols 48-48¼, War Loan 88⅜-88⅝, Funding 72½-72⅝, Victory 75¾-76. Bonds were variable, but closed easy. Home Rail ordinaries went steadily down; but there was some demand for prior charges. Canadians and Argentines were weaker.

The Foreign Market oscillated a good deal almost from day to day, but steadied a bit towards the close. In the Miscellaneous Market, Rubber effected some recovery; but there was little else to cheer holders.

Business in the Gas Market was much quieter, except in two or three undertakings which had it mostly to themselves. The general tendency was steady to a marked degree; the quotations of only two companies undergoing any variation. The London Companies were firm, rather improving upon their prices of the week before, and comparison was favourable in other lines where it presented itself. Primitivas were prominently conspicuous for activity (especially the preference shares) and for considerable advances in value.

Bargains done for cash during the week were as follows: On Monday, Bombay £3 1s. 10½d., Brentford "B" 63½, 64, Brighton and Hove original 111, 112, Continental Union 18, Croydon "B" and "C" 121, 122, European 7, 7¼, 7⅛, Gas Light ordinary 60½, 60¾, 60⅞, 60⅞, 61, ditto preference 60, ditto debenture 50½, Imperial Continental 127½, Primitiva preference 34s. 9d., 35s., 35s. 6d., South Metropolitan 70⅛, 70¼, 70⅜, 71, South Suburban debenture 74, South Metropolitan 6½ p.ct. debenture £57 paid 61, ditto fully-paid 100⅝-101¼. On Tuesday, Bombay £3 0s. 6d., Gas Light ordinary 59⅝, 60, 60⅛, 60½, 60⅝, ditto preference 60, Imperial Continental 126, Primitiva 15s., ditto preference 35s., 37s. 6d., 38s., 40s., 41s., South Metropolitan 70, 70⅛, 70⅜, 70½, 70⅝, 71, ditto preference 93½, 94, 94½, ditto 6½ p.ct. debenture £57 paid 60¾-61¼, ditto fully-paid 101¼. On Wednesday, Brentford "A" 68¾, ditto "B" 63½, British 23, Commercial 4 p.ct. 55½, ditto 3½ p.ct. 52, European 7, Gas Light ordinary 59⅝, 60⅛, 60½, 60⅝, Imperial Continental 126, Primitiva 14s. 6d., 15s. 6d., 15s. 7½d., ditto preference, 39s., 40s., 40s. 3d., South Metropolitan 70⅛, 70¼, 70⅜, 71, ditto debenture 49, ditto 6½ p ct. debenture £57 paid 60⅝-60⅞, ditto fully-paid 100⅜ 101¼. On Thursday, Brentford "B" 64, British 23¼, Commercial 4 p.ct. 55½, Gas Light ordinary 59⅝, 60, 60⅛, 60¼ 60⅜, 60⅝, ditto debenture 50½, Primitiva preference 38s. 9d., 39s., 40s. 3d., South Metropolitan 70, ditto 6½ p.ct. debenture fully-paid 100⅞-101¼, South Suburban 67½, 68, ditto 7 p.ct. debenture 99½. On Friday, Bournemouth 5 p.ct. 8, ditto "B" 8⅞, 9, Commercial 4 p.ct. 56⅜. Continental Union 18, Gas Light ordinary 59⅝, ditto debenture 51, 51⅛, 51⅜, 51½, Imperial Continental 127½, Primitiva 14s. 9½d., ditto preference 39s., 39s. 6d., 40s., South Metropolitan 70⅛, 70⅜, ditto 6½ p.ct. debenture £57 paid 60⅜, ditto fully-paid 101¼, 101½, South Suburban 68¼, Tottenham "B" 53, 54, ditto debenture 55.

In the Money Market, an increase in firmness ruled for the first half of the week, but this relaxed to some extent and at the close the position was easier. Discount was much the same. Silver rose to 41½d., in response to an Indian demand. The Bank rate is 5½ p.ct., as fixed on July 12.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Apl. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	45—48	...
574,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Aug. 11	7½	4/-	Bombay, Ltd.	5⅛—6⅛	3—3⅛	3/0/6-3/1/10½
100,000	5	,,	16	4/7½	Bournemouth Gas & Water { 5 p.c.	...	7⅞—8⅛	8
					B 7 p.c.	15—15½	8⅛—9⅛	8⅛—9
383,110	10	,,	7	7/-	Pref. 6 p.c.	13¾—14	7⅞—8⅛	...
115,000	10	,,	6	6/-	4 p.c. Deb.	...	54—59	
162,065	—	June 30	—	4%	Brentford A Consolid.	261—266	67—70	68⅛
992,045	Stk.	July 15	14	56/-	Do. B New	204—209	62—65	63½—64
734,920	,,	,,	11	55/-	Do. 5 p.c. Pref.	109—111	68—72	...
55,000	,,	,,	5	5%	Do. 4 p.c. Deb.	91—93	57—59	...
221,400	,,	June 15	4	4%	Brighton & Hove Orig.	208—213	110—115	111—112
214,775	,,	Aug. 26	11	10½%	Do. A Ord. Stk	154—159	77—82	...
244,200	,,	,,	8	7½%	Bristol 5 p.c. max.	...	...	...
1,287,500	Stk.	July 28	5	5%	British	44—45	22—24	23—23⅛
530,000	20	Mar. 30	12½	10%	Do. 4 p.c. Deb. Stk	88—90	55—58	...
120,000	Stk	June 30	4	4%	Buenos Aires 4 p.c. Deb	85—87	39—42	...
245,771	,,	,,	4	4%	Cape Town & Dis., Ltd	1⅞—2⅛	6¼—7¼	...
100,000	10	May 27	—	6%	Do. 4½ p.c. Pref.	4—6	4⅛—5⅛	...
100,000	10	Apl. 28	—	4½%	Do. 4½ p.c. Deb. Stk.	70—75	53—58	...
100,000	Stk.	June 30	4½	4½%	Chester 5 p.c. Ord.	108—110	...	...
157,150	,,	Feb. 26	5	5%	Commercial 4 p.c. Stk.	106—108	54—57	55½—56½
1,513,280	,,	July 28	5/9/4	42/8	Do. 3½ p.c. do.	103—105	52—55	52
560,000	,,	,,	5½	38/4	Do. 3 p.c. Deb. Stk.	69½—71½	44—47	...
475,000	,,	June 15	5	5%	Continental Union Ltd	76—79	18—20	18
800,000	,,	Dec. 11	4	—	Do. 7 p.c. Pref.	115—118	30—40	...
200,000	,,	,,	7	—	Croydon A 10 p.c.	...	150—155	...
51,600	,,	Aug. 26	15	15%	Croydon B and C 7 p.c	..	120—125	121—122
278,400	—	,,	12	12%	Derby Con. Stk.	125—128	...	...
492,270	Stk.	—	6	4½%	Do. Deb. Stk.	102—104	...	...
55,000	,,	—	4	4%	European, Ltd.	17⅛—18	7—7½	7—7 15/16
1,002,180	10	Jan. 29	10	5/0	Gas Light and Coke { 4 p.c. Ord.	98—102	59—61	59½—61
16,398,975	Stk.	Aug. 11	4/17/4	46/8	3½ p.c. max.	76—79	44—46	...
2,600,000	,,	,,	3½	35/-	4 p.c. Con. Pref.	96—99	58—60	60
4,062,335	,,	,,	4	4%	3 p.c. Con. Deb.	72½—74½	50—52	50½—51½
4,674,850	,,	June 15	3	3%	10 p.c. Bonds.	...	...	...
130,000	,,	Dec. 11	10	10%	Hastings & St. L. 5 p.c.	...	48—50*	...
82,500	,,	Sept. 14	5	3⅛%	Do. 3½ p.c	87—89	34—36*	...
258,740	,,	,,	3½	2⅛%	Hongkong & China, Ltd.	16½—16⅝	5—6	...
70,000	10	May 12	11	5%	Hornsey 7 p.c.	...	78—83	...
86,600	Stk	Aug. 26	9	9½%	Ilford A and C	151—154	78—80	...
131,000	,,	July 28	7½	7½%	Do. B	115—118	57—59	...
65,780	,,	,,	6½	5⅛%	Do. 4 p.c. Deb.	92—94	54—56	...
65,500	,,	June 30	4	4%	Imperial Continental	150—160	125—130	126—127½
1,976,000	,,	May 27	9	5%	Do. 3½ p.c. Deb. Red.	84—86	79—81	...
1,235,000	,,	Aug. 11	3½	3½%	Lea Bridge Ord. 5 p.c.	119—121	68—70	...
235,242	,,	Mar. 30	6½	3⅛%	Liverpool 5 p.c. Ord. { A	211—215	...	...
2,498,905	,,	Feb. 26	10	37/6	B	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk	...	...	...
163,736	,,	Aug. 11	7/5/6	6%	Maidstone 5 p.c.	...	54—56	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb.	...	40— 43	...
75,000	5	June 11	6	3%	Malta & Mediterranean Met. of Melbourne { 4½ p.c.	4⅛—4½	1½—2½	...
250,000	100	Apl. 1	4½	4½%	4½ p.c. Deb.	99—101	88—93	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	55—60	...
1,875,892	,,	July 28	4½	3%	Newcastle & Gatsh'd Con.	98½—99½	57½—58½	...
529,705	,,	June 30	3½	3⅛%	Do. 3½ p.c. Deb	82—83	48½—50½	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/10	5/3	,, ,, 7 p.c.	14—15	7⅛—8*	...
300,000	Stk.	May 12	8	8%	Oriental, Ltd.	117—122	88—93	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	2—3	...
188,120	Stk.	June 30	—	3⅛%	Plym'th & Stonch'se 5 p.c.	...	64—67	...
60,000	50	Aug. 26	13	60/-	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/-	Do. C	118—121	61—64	...
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	1 11/16—1 13/16	14/6—15/7½
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4⅝—5	1⅝—2⅛	34/9—41/-
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	65—67	...
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1913	...	39—42	...
546,191	,,	June 30	4	4%	River Plate 4 p.c. Deb	85—87	39—42	...
150,000	10	Mar. 30	6	6/-	San Paulo { 6 p.c. Pref	10¾—11	6—6½	...
125,000	50	June 30	5	5%	5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	61—62	...
209,984	,,	,,	10	5%	Do. B	222—224	60—62	...
523,500	,,	,,	10	4½%	Do. C	220—222	59—61	...
133,201	Stk.	Sept. 13	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 30	9	8%	South African	10⅛—11⅛	7—9	...
6,609,895	Stk.	July 28	5/4/-	5%	South Met. Ord.	111—115	69—71	70—71
250,000	,,	July 14	—	5%	Do. Red. Pref.	...	93—95	93¾—94⅛
1,895,445	,,	,,	3	3%	Do. 5 p.c. Deb.	72⅛—74⅛	48—50	49
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk	157—159	85—87	...
1,087,795	,,	Aug. 11	6	5⅝%	S'th Suburb'n Ord. 5 p.c.	114—116	67—69	67½—68½
368,837	,,	June 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	73—76	74
647,740	,,	May 12	7½	5⅞%	Southampton Ord.	99—102	55—58	...
121,275	,,	June 30	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 11	—	6%	Tottenham { A 5 p.c.	135—138	62—64	...
782,275	,,	,,	6	4½%	District { B 3½ p.c.	113—117	52—54	53—54
181,255	,,	June 15	4	4%	4 p.c. Deb.	87—89	54—57	55
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Aug. 26	5	5⅛%	Tynemouth 5 p.c. max.	108½—109	66½—68½	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	8½	66/3	Wandsworth A 5 p.c.	151—156	78—80	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	57—59	...
108,075	,,	,,	—	46/4½	Do. C	...	55—57	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	53—55	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	56—58	...
88,416	..	June 30	4	3%	5 p.c. Deb. Stk.	66—69	44—47	...

* Ex Div.

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E. ALLISON,
Engineer and General Manager.

Gas Offices,
High Street, Gosport,
Sept. 21, 1921.

WOMBWELL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

APPOINTMENT OF CHIEF CLERK.

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Applications, stating Age, Experience, and Qualifications, accompanied by *copies* of Two recent Testimonials and endorsed "Chief Clerk, Gas Dept.," must be sent to the undersigned not later than 9 a.m. on Monday, the 3rd day of October, 1921.

P. M. WALKER,
Clerk to the Council.

Town Hall,
Wombwell,
Sept. 16, 1921.

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